PETROLEUM PROCESSING

including Petrochemical Processing Section

DECEMBER 1954

The Outlook for 1955

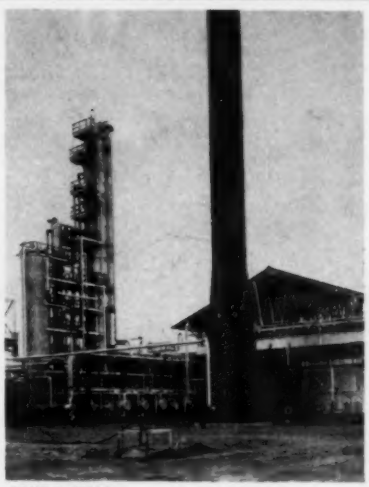
Product demand up, excess refining capacity up, export trade down, octanes up
—p. 1867

Flexibility in Design

Five factors to consider in developing a more useful refinery process design
—p. 1881

King-Size Zipper

It's an efficient conveyor for moving catalyst from hopper car to storage
—p. 1885



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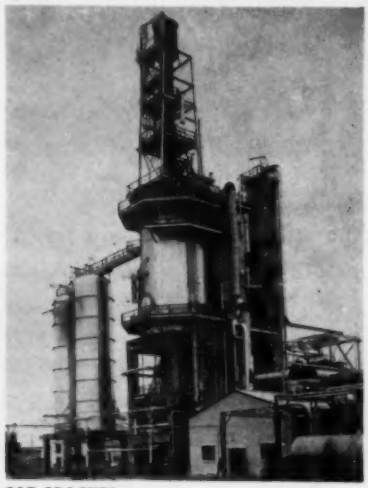

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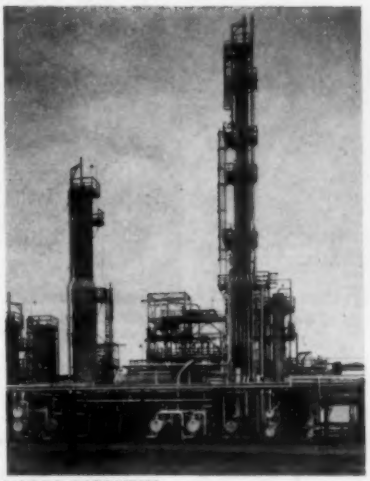

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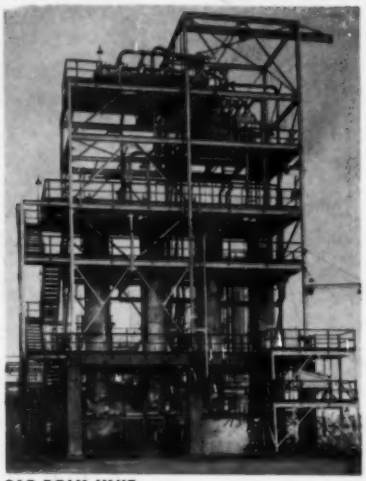


CAT POLY UNIT

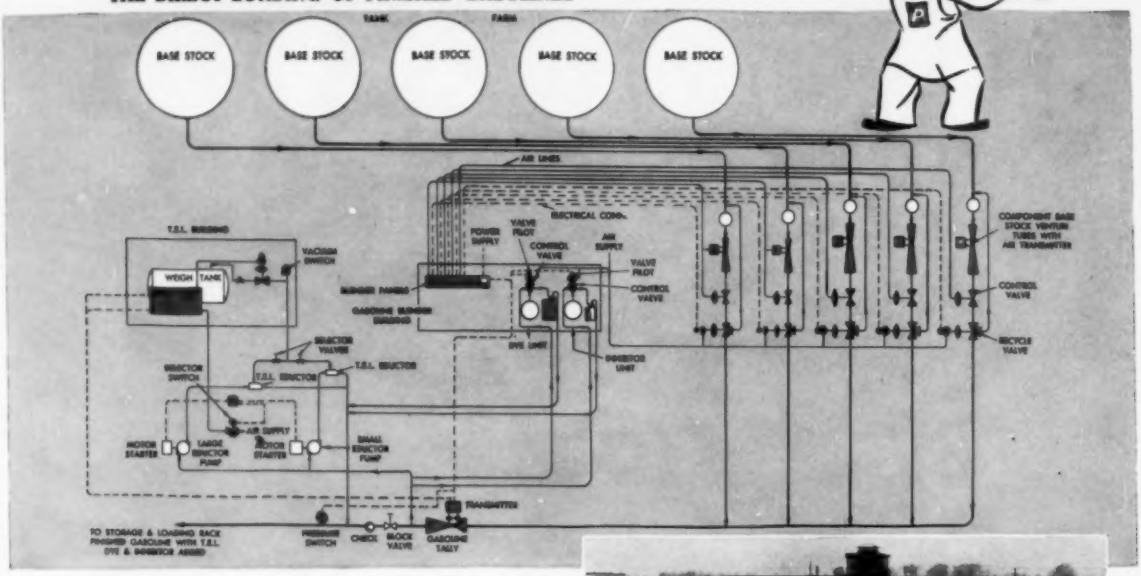
'Four-in-One' Processing

Combination operation at Mandan—p. 1873

A McGRAW-HILL PUBLICATION

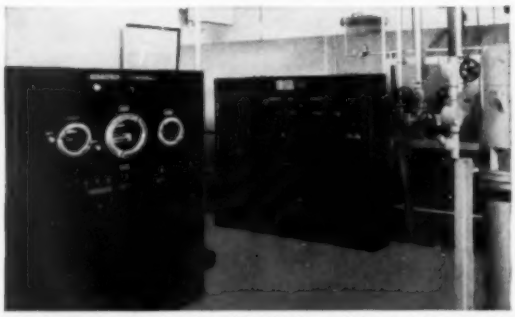
Are you still Batch Blending?

%PROPORTIONEERS% "ON-STREAM" BLENDING SYSTEM PROVIDES NEW SPEED, FLEXIBILITY AND ECONOMY IN THE DIRECT LOADING OF FINISHED GASOLINES

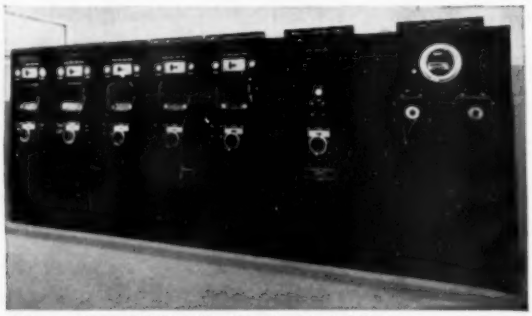


%PROPORTIONEERS% "on-stream" blending methods combine two or more liquid components in any proportion by weight or volume and formulations are maintained under all circumstances by automatic built-in "fail-safe" design features. Costly mixing tanks are eliminated, manpower and plant space saved, and internal transfer problems are greatly simplified. Ask for recommendations and descriptive literature.

New plant of Canadian Oil Refineries, Ltd. at Sarnia, Ontario, employs %Proportioneers% equipment to continuously blend five gasoline components, TEL, and dye, in producing its famous White Rose products at loading rates up to 2,880 barrels per hour. Photo shows Automatic Blend Manifold with Pump House and Control Room in background (TEL building in left hand corner).



%Proportioneers% Loss-in-weight Scale and Control Panel adds TEL to finished blend in proportion to flow rate.



%Proportioneers% Gasoline Blender Control Panels with automatic batch cutoff panel at right.

Write to Proportioneers, Inc., 447 Harris Ave., Providence 1, Rhode Island.

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The way things were going, there had to be something new in diesel fuels!

As you probably know, demand for diesel fuels has increased sixfold since 1941 and was threatening to outrun available supplies of middle distillates of the desired ignition quality.

So Ethyl went to work.

Out of our long experience in the field of fuel additives, we were able to come up with an answer. It is a new additive called "Ethyl" Diesel Ignition Improver, which will upgrade heating oils to diesel fuel quality quickly and economically. It was tested in marine engines, railroad locomotives, and trucks. Everywhere the report was the same: *Cetane numbers gained through the use of "Ethyl" Diesel Ignition Improver are equal to natural cetane numbers.*

(*Continued on next page*)

Printed in U.S.A.

Something new in diesel fuel

(*Continued from preceding page*)

As a result, diesel fuels improved with Ethyl's new additive are being successfully used in U. S. Navy ships and submarines, and in diesel engines on the road and on the rails.

Our new additive offers several extra advantages to refiners. First, it is now possible to produce large quantities of specification diesel fuels simply and economically. Second, our new additive will increase the flexibility of refining operations. Third, because it is so simple to mix, it enables refiners to upgrade heating oils to diesel fuel quality, either at the refinery or at bulk terminals. Fourth, it enables refiners to market diesel fuels of more uniform ignition quality.

We like to cite the development of "Ethyl" Diesel Ignition Improver as an example of how we were able to be of service to refiners by anticipating what might have become an industry problem.

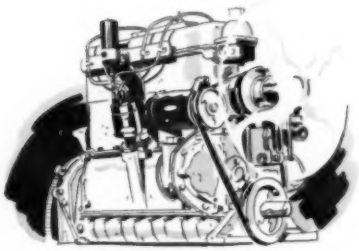
ETHYL CORPORATION

NEW YORK 17, NEW YORK

WORTH NOTING

During 1954, Ethyl's advertisements supporting the oil industry's public-relations program appeared in national magazines reaching more than 31,000,000 readers.

Seventy-five per cent of all work on American railroads is done by 20,000 diesel locomotives—more and more of which each year use fuels improved with "Ethyl" Diesel Ignition Improver.



The experimental XO-121, the world's most efficient tractor engine, developed by the Oliver Corporation, was designed and tested with the assistance of Ethyl technicians.

Ethyl Service is backed by 31 years of antiknock experience

Don't throw in the sponge!

● We're the first to admit that it is no easy job to specify and buy the thousands of products needed to operate a modern refinery or petrochemical plant. But before you throw in the sponge and retire to that South Sea island, call "Oilwell."

We've been living with procurement problems such as yours for 92 years. Skilled specialists are available who spend all their time working with men like you. Completely stocked warehouses are strategically located so that you can get the item you want direct from our stocks—in a hurry.

Why not call "Oilwell" the next time you have a problem?

Complete warehouse system—Well stocked warehouses are conveniently located to serve the important refining centers. Inquiries are given prompt attention and deliveries are made quickly to meet your emergency requirements.

Lower inventory investments—You can cut your own warehouse stocks to a minimum, reduce obsolescence and get a wider selection of materials, sizes and brand names from "Oilwell's" complete inventories.

Experienced personnel—"Oilwell" refinery specialists, having been trained in refining and petrochemical plants, understand your material and service problems and can give you the service you require.

Quality products — "Oilwell" stocks include the best known brand names in equipment and materials designed and approved for refinery operations. When it comes from "Oilwell," you know it will meet your specifications.

92 Years of experience—From almost the beginning of the petroleum industry, "Oilwell" has worked with the men engaged in drilling and production. Our goal is to extend the same prompt, dependable and complete service to those responsible for Refining and Petrochemical operations.

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Johns-Manville	Vogt
Lunkenheimer	Walworth
Manning, Maxwell & Moore	Watson-Stillman
National Tube	Wilson-Snyder
	Worcester

and many others

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PETROLEUM PROCESSING

Covering petroleum and petrochemical research and the design, construction, management, operation and maintenance of plants processing hydrocarbon materials into fuels, lubricants and chemicals.

December, 1954
Vol. 9, No. 12

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Homeowners and plant managers bought more than 1,103,000,000 gallons of our fuel oil last year—more than ever before.

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Publisher's Page

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Our Annual "Crystal Ball" Project

WE'VE gone and stuck our necks out again. This time we've done it by venturing forth into the realm of the crystal ball—and coming out with our forecasts of what 1955 holds for the industry. If you're in any way associated with refining you'll want to be sure to read it, because it tells you what the immediate future prospects for your company are in a general sort of way.

We don't mean to give you the idea by that reference to crystal balls that our forecasts are based on any "extra-oculary" powers our editors possess, or that they are merely our expression of wishful thinking as to what we would like to see happen. What we see in the future represents the studied concensus of the best economic brains in the industry.

Virg Guthrie of our staff was in charge of the roundup, and he started his digging back in September. Realizing that there are a lot of outside factors which influence the demand for petroleum products, he didn't confine himself to just the oil industry. His surveying brought him into contact with automotive engineers, railroad economists, home heating authorities, and even government officials.

All in all, "Guth" probably contacted over a hundred individuals to assemble the basic facts—and then he had the unenviable task of correlating and consolidating the data.

He's come up with what we think will probably turn out to be a most accurate prediction. Just to illustrate, we've compared his ideas of what 1955 holds with some presented at the recent API meeting by John Boatwright of Indiana Standard. Boatwright predicts an increase in over-all product demand next year of 4.3%—we say 4.1%. Boatwright sees a drop of 18.6% in exports—we see 19.0%.

Guth, however, disclaims any personal credit (or responsibility) for the accuracy of his predictions. As he put it when he turned in the story—"When you call on enough people who have the experience to make forecasts and the data to back up their forecasts, and when you get replies from enough of them, you have a pretty good chance of hitting near the bullseye on the target."

Read it yourself—pg. 1867—and see if you agree.

William F. Bland

Editor

Other McGraw-Hill Petroleum Publications

National Petroleum News
The monthly oil marketing magazine, covering news, prices, transportation, storage, merchandising.

Platt's Oilgram News Service
A daily independent oil-news reporting service issued from New York, Chicago and Houston.

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A daily independent oil-price reporting service issued from New York, Chicago and Houston.

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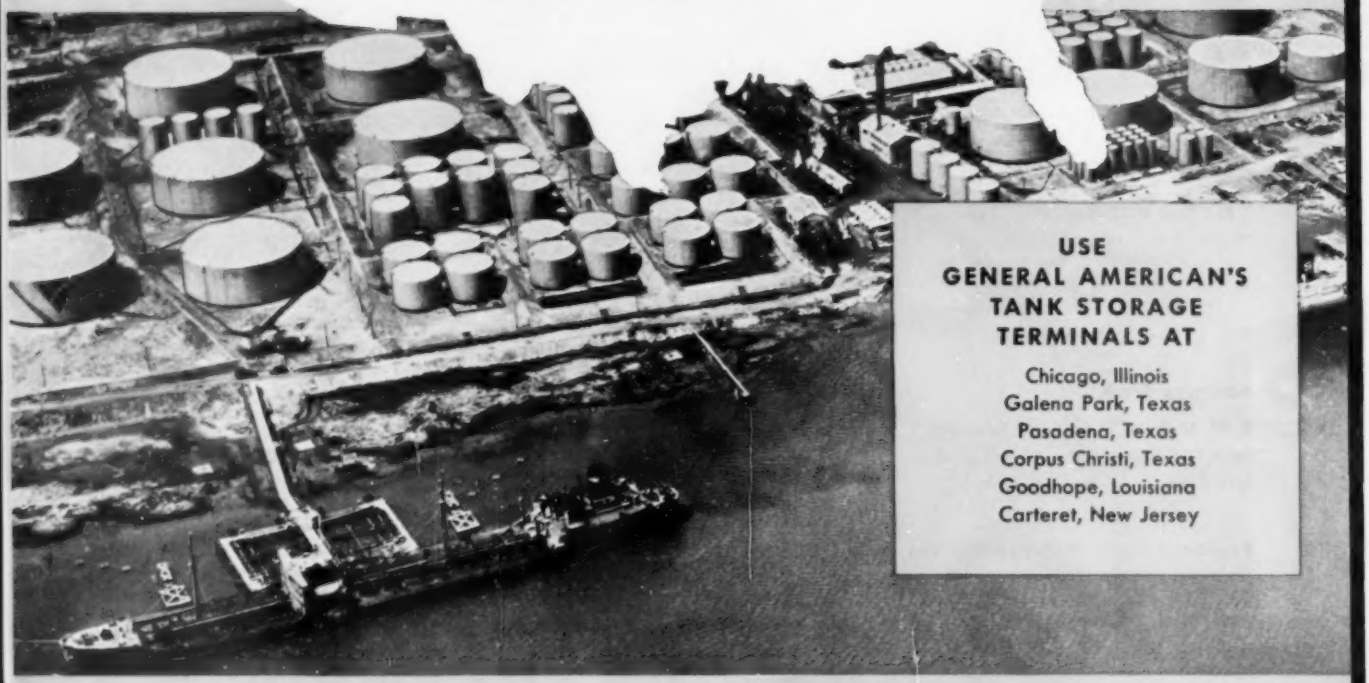

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Aerial view of Carteret, N. J. terminal

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What's Happening...

in Refining

. . . **Great Plains Refinery & Development Co.** plans a $3,000,000, 3000 b/d refinery at Rapid City, So. Dakota, first in that state. Plans include production of 92 and 98 octane gasolines.

. . . **Imperial Oil Ltd.** has awarded Foster Wheeler Ltd. contract to install a new catalytic cracking unit, other process equipment and utility plant at the Imperoyal Refinery near Halifax, Nova Scotia. Contract represents part of $25,000,000 project which will more than double existing 18,000 b/d capacity.

. . . **Pacific Oil & Refining Co.** plans to start construction in mid-March of a new 10,000 b/d refinery at Tacoma, Wash., following completion of a port dredging project to accommodate the newer tankers and provide fill for the 115-acre plant site.

. . . **Phillips Petroleum Co.** has been given approval for fast tax write-off on 16,000 b/d catalytic reforming unit at Borger, Texas. Total cost, including auxiliaries and buildings is estimated at approximately $5,395,000.

. . . **International Petroleum and Chemical Exchange, Inc.,** has received fast tax-write off approvals totaling about $9,500,000 for new refining facilities at Lake Charles, La. Project includes dehydrogenation isomerization, alkylation, and sulfuric acid treating units.

. . . **Champlin Refining Co.** will add a 5000 b/d UOP Platformer to its Enid, Okla., refinery. Southwestern Engineering Co. will build the $700,000 unit, with completion scheduled for next April.

. . . **The Texas Co.** has let a contract for the construction of a 9,000 b/d Unifiner-Platformer unit at West Tulsa, Okla., to Refinery Engrg. Co.

in Petrochemicals

. . . **More natural gas for petrochemicals** may be an indirect result of the recent Supreme Court "Phillips" case, which imposed federal regulation on sales of natural gas by independent producers and gatherers where the gas is ultimately to be transported across state lines. To escape such regulation, many producers are now looking for customers for their undedicated gas supplies who will use the gas within the state—and these include new petrochemical plants.

. . . **Gulf Chemical Co.,** newly formed, plans a 200 ton/day anhydrous ammonia plant at Pensacola, Fla., at estimated cost of $22,920,000; part of the ammonia to be converted to nitric acid and ammonium nitrate. Firm also plans facilities for 40 ton/day of polyvinyl chloride. Completion is expected by early 1956. Natural gas raw material will be purchased from United Gas Pipe Line Co., a subsidiary of United Gas Corp. United Gas has filed a request with Securities and Exchange Commission to acquire an interest in Gulf Chemical.

. . . **Shell Chemical Corp. and Goodrich-Gulf Chemical, Inc.,** are among four companies who are nearing the contract-signing stage with the federal government for purchase of synthetic rubber plants.

Shell is bidding on two California plants with total annual capacity of 150,000 tons. Goodrich-Gulf is seeking two plants at Port Neches, Texas, including a 197,000-ton butadiene plant. Other two firms are American Synthetic Rubber Corp. and Copolymer Corp.

. . . **Inland Chemicals of Canada Ltd.** has awarded Lummus Co. Canada Ltd. contract for construction of a 100 ton/day, $1,000,000 sulfuric acid plant at Ft. Saskatchewan, Alta. Plant will be located adjacent to nickel ore processing plant of Sherritt-Gordon Mines Ltd. and will use as feed stock pure sulfur from Shell Oil's Jumping Pound, Alta., plant. Acid is to be supplied to Sherritt-Gordon and other users in western Canada.

. . . **Commercial Solvents Corp.** has awarded contract to Tears Engineers for design and equipment for the separation and purification section of the $5,000,000 nitroparaffin plant at Sterlington, La. Completion is expected by August, 1955.

. . . **West Germany's petrochemical industry** is in for considerable growth in the next few years. Between 300,000 and 400,000 ton/yr. of refinery gases will become available after current cracking plant construction projects are completed.

in Transition

. . . **Husky Oil & Refining, Ltd.,** has purchased the Riverlake Oils, Ltd., including a refinery at Fort William, Ont. (on Lake Superior), and marketing outlets in the Great Lakes area. Plans are under way to double capacity, to 5000 b/d, and to install new catalytic reforming unit, a "diesulformer" to make low sulfur Diesel fuels, and asphalt refining unit.

In another transaction, Husky bought the 2000 b/d refinery of Trans-Empire Oil Ltd. at Moose Jaw, Sask. Trans-Empire will withdraw from refining field.

. . . **Union Oil Co.** has purchased for an undisclosed sum Sunray Oil Corp.'s 5000 b/d asphalt and products refinery at Santa Maria, Calif.

. . . **Stockholders have approved merger** agreement of Colorado Oil & Gas Corp. (Denver) and Derby Oil Co. (Wichita). Colorado has formed a wholly-owned sub-

Information on these pages is obtained through the nation-wide news coverage service of PLATT'S OILGRAM NEWS

sidiary, Derby Refining Co., to operate the Wichita refinery and marketing facilities of Derby.

. . . **Union Carbide Canada Ltd.** has purchased the Montreal East petrochemical plant of Dominion Tar & Chemical Co. No figure was disclosed, but the plant was built in 1951-52 at a cost of $10,500,000.

in Foreign Operations

. . . **Esso Petroleum Co.** will build an $11,200,000 Hydroformer unit at the 120,000 b/d refinery at Fawley, England.

. . . **Corporacion General de Petroleo** and Refineria Cabaiguan will build a new 1000 b/d refinery for processing asphaltic base crudes near Havana, Cuba. Kerr-McGee Industries will assist, and new plant is separate from Refineria Cabaiguan's 1000 b/d plant.

. . . **Shell Co. of Ceylon** has agreed to feasibility of establishing a refinery in that country. No final decision has yet been made on location; however, Hendala, six miles from Colombo, is considered the best. Ceylon currently imports about 2,800,000 bbl. annually of gasoline, Diesel and fuel oil.

. . . **Finland** government is considering construction of a 9000 b/d refinery. Russia now supplies the bulk of Finnish imports of refined products.

in Markets and Prices

. . . **Spurred by slightly colder-than-normal** weather, distillate and residual fuels moved out of primary storage in increasing volume in November. But, gasoline shipments were leveling off and, with inventories 7,500,000 bbl. above comparable year-ago levels, motor fuel was still the refiner's biggest headache—same as it has been throughout most of the past summer.

. . . **Foreign developments vied** with domestic markets for the center of attention. Agreement between Iran and international consortium to operate the Iranian oil industry became effective Oct. 29. And the various members of the consortium—eight international oil companies—posted price of $1.91 per bbl. for 34-34.9 gravity crude, FOB Bandar Mashur, for export in cargo lots.

While return of Iranian oil to the scene will be gradual—about 300,000 b/d set for 1955; 475,000 b/d for 1956; and 600,000 b/d for 1957—some industry observers see it as a further drag on the U. S. industry, already faced with excess producing and refining capacity.

. . . **In domestic markets, price movements** reflected seasonal trends. Light and heavy fuels were quoted higher in the Mid-Continent and Midwest, were firming up on the Atlantic Seaboard and at the Gulf.

Group 3 price for No. 2 fuel was up 0.125¢, to low of 8.375¢/gal., and No. 6 oil was quoted 5¢ higher, at $1.35/bbl. Discounts from quoted prices, which had been ruling at seaboard points, were lessening. Natural gasoline prices rose 0.5¢, with Grade 26-70 quoted at 5.5¢, Group 3, and 5¢, Breckenridge.

in Labor and Law

. . . **Latest developments in labor:**

Oil Workers International Union has cancelled its no strike pledge of last June 4, and has notified local bargaining teams to advise oil companies that strike can come if necessary to win "a general wage increase of 5% or equivalent."

Joint convention of OWIU and the Gas, Coal, and Chemical Workers Union to vote on approval of the merger of the two unions has been set for about Feb. 28 in Cleveland. Both unions plan separate conventions just before the joint meeting.

. . . **Tax on sulfur from natural gas** is legal now in Texas. The state won its court fight to collect sulfur production taxes on brimstone made from "sour" natural gas. Companies have paid $297,026 under protest. Phillips Chemical Co., who brought suit, has paid $129,273, and had argued that levy was aimed at sulfur produced by usual mining methods, not by extraction from gas.

. . . **Stock purchase plans** to which company contributes are a proper point for collective bargaining, according to a ruling made by National Labor Relations Board on a case in which Richfield Oil Corp. was the target. This was first time NLRB has ruled on this score—for oil or any other industry.

Looking Ahead

. . . **Possible use of atomic radiation** in the actual manufacturing of petroleum products will be studied in a new radioactivity laboratory Standard Oil Development Co. is building at its Esso Research Center in Linden, N. J. The new laboratory, being built at a cost of around $250,000, is expected to be in operation next spring.

. . . **Octane demand trend continues upward,** as indicated by fuel needs for some of the 1955 model cars were reported:

Needing premium grade: Buick's three top models; Cadillac; Chevrolet's 162-hp. V-8 (after 4000 miles, though operable on regular grade at first); Chrysler's New Yorker and Imperial models; Ford's Fairlane model; Pontiac's 180-hp. V-8.

Needing regular grade: Buick Special; Chrysler Windsor; Dodge; Ford (other than Fairlane); Plymouth.

. . . **Push-button lubrication** by the driver is being made available as optional equipment on 1955 Lincoln automobiles, at a cost of about $50. Using an SAE-90 lubricant with non-drip additive, system carries enough lube in a reservoir for 10,000 miles of driving. Replacement reservoir cans will be sold only through Lincoln dealers.

CHEMICAL FOR TEMITE BUITYRATE USED FOR NEW PLASTIC PIPE

VARNISH, SHELLAC AND PAINT

MOTOR OIL AND GASOLINE (ADDITIVES)

For new customers...and bigger sales...specify ENJAY

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Here's why more and more industries in the paint, chemical and surface coating fields rely on Enjay. They know Enjay supplies a complete line of uniform, high quality petroleum chemicals, and assists in developing new or improved products through chemistry...the products that win new customers and bigger sales.

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Methyl Ethyl Ketone
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Isopropyl Ether
Reference Fuels

SURFACE COATING

PETROHOL 91
PETROHOL 95
PETROHOL 99
JAYSOL
Secondary Butyl Alcohol
Secondary Butyl Acetate
Isopropyl Acetate
Acetone
Methyl Ethyl Ketone
Dicyclopentadiene
Ethyl Ether
Isopropyl Ether
Naphthenic Acids
Iso-Octyl Alcohol
Decyl Alcohol
Denatured Ethyl Alcohol

CHEMICAL

PETROHOL 91
PETROHOL 95
PETROHOL 99
JAYSOL
Iso-Octyl Alcohol
Decyl Alcohol
Denatured Ethyl Alcohol
Tridecyl Alcohol
Dicyclopentadiene
Isoprene
Butadiene
Ethyl Ether
Isopropyl Ether
Tetrapropylene
Tripropylene
Aromatic Tars
Benzene
Acetone
Methyl Ethyl Ketone

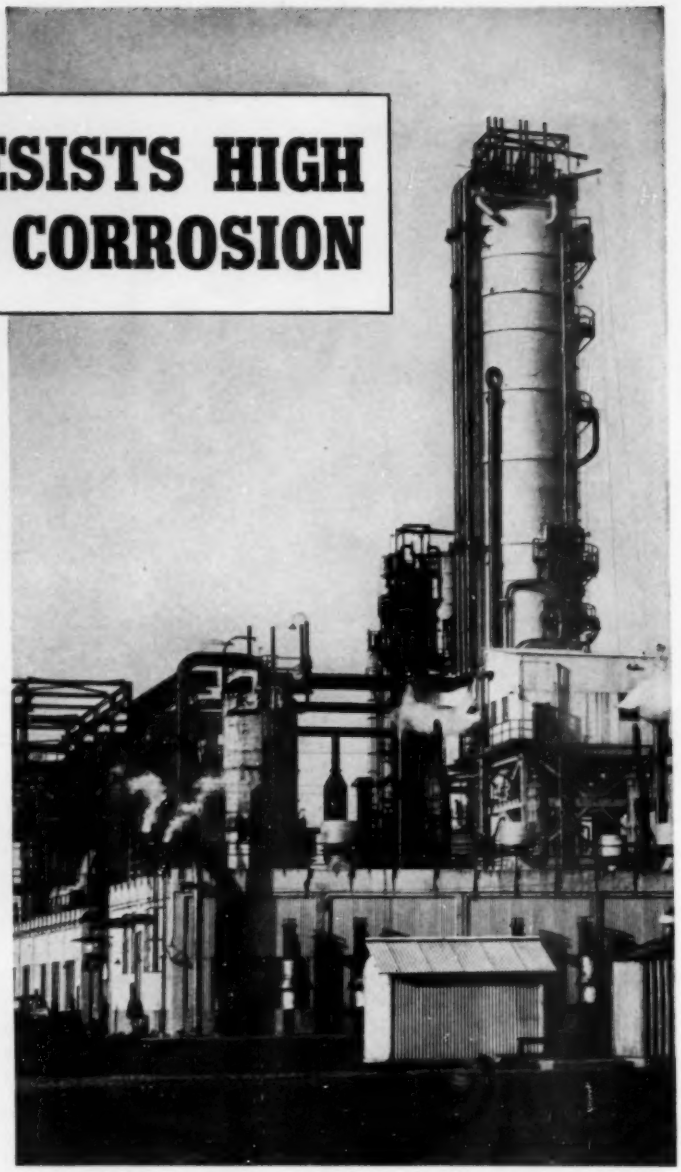
(To obtain more data on advertised products see page 1924)

CLAD STEEL RESISTS HIGH TEMPERATURE CORROSION

High sulphur content of varying feeds in this catalytic cracking unit made corrosion resistance vital if maintenance were to be kept down. To meet this threat effectively and *economically*, the equipment engineers recommended the use of clad steel in construction. Type 405 stainless-clad steel gives effective corrosion resistance in the reactor, where temperatures range from 925° to 950°F. In addition, in the lower portion of the fractionating tower, Type 405 stainless-clad stands up to sulphur corrosion at the 650°F. operating temperature.

Even though feeds vary from heavy vacuum gas oil to light gas oil, operation has been continuous except for scheduled yearly inspection shutdowns since the unit went on stream over four years ago. Chances of an unscheduled shutdown or equipment failure interrupting throughput are reduced, and maintenance is held to a minimum. The layer of stainless, permanently and integrally bonded to low-cost carbon steel backing plate, does the job of the expensive solid alloy. Clad steel eliminates the danger of seepage or crevice corrosion.

A wide range of clad steel types makes it easy to meet your processing problems *economically*. Clad steel tanks and pressure vessels minimize first cost, have long, trouble-free life, will withstand high pressures and temperatures, permit easy and economical field erection. A combination of versatile clad steels and modern fabricating techniques, teamed with sound engineering, will give you these benefits. Working in close coordination with your engineers and consultants *from the start*, a qualified fabricator can tailor equipment to your exact processing needs.



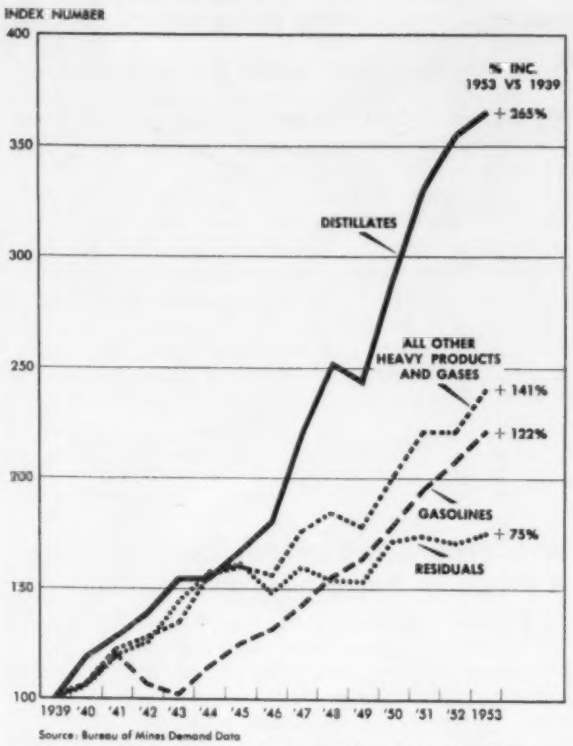
Type 405 stainless-clad steel in the lower 92 feet of this fractionating tower resists sulphur corrosion economically at 650°F. At even higher temperatures of 925°-950°F. in the reactor, the same clad steel is used to resist corrosion.

Ask one of your fabricators to show you the new Lukens clad steel movie, "Equip for New Profits." Here—in full color and sound—are factual accounts of how clad steel equipment brings new economies. The story can suggest new ideas to everyone concerned with production efficiency. Or, contact Manager, Marketing Service, Lukens Steel Company, 682 Lukens Building, Coatesville, Pa.

LUKENS CLAD STEELS

STAINLESS-CLAD · NICKEL-CLAD · INCONEL-CLAD · MONEL-CLAD

PRODUCER OF THE WIDEST RANGE OF TYPES AND SIZES OF CLAD STEELS AVAILABLE ANYWHERE



DOMESTIC DEMAND FOR DISTILLATES has been growing at a faster rate than that of any other principal product

Alarm Sounded Over the Future Growth Rate of Distillate Fuels

WHILE calling attention to the importance today of the middle distillate products to refiners, petroleum marketers sense a future decline in the rate of gain in their consumption, unless the oil industry helps to promote their use, particularly heating oils.

"The importance of distillate fuels in our industry has been for too long overlooked or underrated," James Dyer, president of Sinclair Refining Co., told an API audience at its recent annual meeting in Chicago.(1) He presented impressive figures to show their growth both in volume and in value. By 1953, it was stated, demand for distillate fuels had increased almost 1,000,000 bbls. a day from 1939 and the 1953 figure of 1,351,000 bbls. daily represented a boost of 265% in 15 years. "By comparison, during the same years, gasoline demand rose 122%. . . . Total crude runs in our refineries advanced 106%."

In gross dollar volume, arrived at by multiplying total demand figures by average refinery prices, over the 15-year period; that for distillate fuels increased 865%, that for gasoline 359%, for crude oil 442%.

The demand over this period made itself felt in increasing yields in refinery operations, that for distillates growing from 13% in 1939 to 21% in 1953. This was at the expense of products other than gasoline. Total yield for these declined from 42% to 34%, while that for gasoline, with some fluctuations, remained around 45% U. S. average during the period 1939-53.

To date, the growth in distillate fuels has been without organized efforts by the oil companies to promote their use, aside from the work of the independent oil marketers. Today their utilization in the two principal markets is slowing down, it was pointed out. The sales curve for heating oils, accounting for about 55% of total distillates consumption, is beginning to drop markedly, due to some extent to the recent mild winters but, more importantly, to the growing use of natural gas. "In the years before World War II, oil heating was outselling gas heat 3:1. . . . Since the war the ratio has been 50:50. . . . In some areas which used to be oil heating strongholds, gas is now outselling oil 3:1."

Second largest market for distillate fuels is in Diesel engines on the railroads. By 1953 this accounted for about 15% of the industry's distillate sales and today it is about 20%. "However, the growth rate of the railroad market will be slowing down in the years ahead because the Dieselization of the U. S. railroads is virtually completed," it was stated. In other fields of consumption the use of distillates by gas-producing plants has fallen away to about 1% of total demand.

Foreseeing continuing competition in the heating field from natural gas, heat pumps and possibly by nuclear energy, Sinclair's president urges that the petroleum industry's scientists tackle the problem of finding uses for distillate fuels which will not only supplement present markets but create new ones which will allow the refiners to use their distillate producing facilities more evenly over the year. —V. B. G.

(1) "The Importance of Distillate Fuels in the Petroleum Industry" James E. Dyer, president, Sinclair Refining Co.; Group Session on Marketing, Nov. 8, 1954, 34th Annual Meeting, API Chicago.

Study of Nitrogen Constituents Will Be Helpful Tool for Refiners

THE latest API research project, on nitrogen compounds in petroleum, holds promise of providing much helpful data for use in solving some of the processing and product storage problems.

API Research Project 52 is less than a year old, but work on it has been expedited and its first progress report was included in the papers prepared for the recent API meeting in Chicago.(1)

The pressing need for the work lies in the extensive use by refiners of catalysts in various processing methods. "The presence of nitrogen compounds reduces the activity of cracking catalysts," the report states. "It has been demonstrated that these materials in catalytic charge stocks seriously decrease their conversion into gasoline. Other catalysts, such as most of those used in reforming, polymerization and isomerization, are highly susceptible to poisoning by nitrogen compounds."

Other serious problems arising from the presence of these constituents in petroleum include the formation of gum and precipitates in burner fuels. They are intimately connected with the formation of soluble and insoluble gums in diesel fuels in storage. In gasoline

they increase the formation of lacquer on pistons and piston rings, and gum deposits in carburetors. Evidence is reported that even in trace amounts they cause color deterioration in some products.

The nitrogen content of crude oils has been found to range from traces to as much as 0.9% by weight in some California crudes. The increasing trend toward cutting deeper into crude oil for the preparation of catalytic cracking charge stocks accentuates the harmful effect because of the greater amount of nitrogen compounds in the heavy ends.

The work will be in three parts. A study of the fundamental chemistry of nitrogen compounds will be carried on at the University of Kansas. The second phase will be a separation of these compounds, first from synthetic mixtures, then from samples of concentrates, at the Bureau of Mines Laramie station. The third phase will be the small scale synthesis of nitrogen-containing compounds which occur in petroleum. Chairman of the project is G. R. Lake, Union Oil Co. of California.

—V.B.G.

(1) "API Research Project 52—Nitrogen Constituents in Petroleum," J. S. Ball, U.S. Bureau of Mines, Laramie, Wyo.; C. A. Vanderwerf, University of Kansas, Lawrence, Kans.; G. Waddington, U.S. Bureau of Mines, Bartlesville, Okla.; G. R. Lake, Union Oil Co. of California, Brea, Calif. Presented at Group Session on Fundamental Research, Nov. 8, 1954 during 34th annual API meeting, Chicago.

Wide Range of Fuels that Fits Jet Needs Can Lessen Supply Problem

A SOLUTION to the problem of supplying sufficient quantities of jet fuel for military and commercial aircraft may be in the offing, according to test results reported at the Los Angeles Aeronautic meeting of Society of Automotive Engineers by engineers of The Texas Co.(1)

Studies with 14 fuels of widely varying characteristics in five different combustors from aircraft gas turbines under simulated flight conditions showed relatively small differences in combustion efficiency over the range of operating speeds customarily used in flight. The problem of increased deposits with the less volatile (heavier) fuels can be minimized, if not eliminated, through design changes and cooperation among refiners, engine designers and airframe manufacturers.

Studied in combustion efficiency tests were unleaded avgas; jet fuel types JP-1, 3 and 4; Nos. 1 and 2 fuel oils; heavy automotive type diesel fuel, and a No. 4 fuel made from a cut-back residual stock generally used for industrial heating.

Under full-throttle conditions, it was indicated that the different fuels showed relatively the same combustion efficiency. However, under part-throttle conditions a significantly lower efficiency was noted with the heavier fuels at high altitudes; this is believed due to lowered nozzle performance because of the lower fuel flow rates.

Of even more significance, nevertheless, is the fact that different combustors by no means rated the fuels in the same order and all fuels fall within a comparatively narrow band. Thus a much greater efficiency spread exists between different engines using the same fuel than between widely varying fuels in the same engine.

Deposits were found to vary both in location and amount when the same fuel was run in different engines; the amount of deposit in general being found of lesser importance than its location so far as continued or satisfactory operation was concerned.

The prospects look bright, in the light of these findings, that refiners may not be faced with so serious a potential problem in supplying jet fuels than has previously been believed. While the Texaco tests still favor the straight-run fuels over those containing aromatics, and lower end-point blends than those approaching the residual fuel category, it has been shown that a wide range of fuels, both in boiling range and endpoint, *can* be used in jet engines —D.P.T.

(1) Kuhbach, C. M., Ritcheske, W. F., and Strauss, K. S., "Fuel Properties and Jet Engine Combustor Performance," presented at SAE Los Angeles Aeronautic Meeting, Los Angeles, Oct. 5-9, 1954.

Will Fluorocarbon Surfactants Have A Place in Petroleum Processing?

MINUTE percentages of fluorocarbon surfactants added to hydrocarbons may upset many "inviolable" concepts about processing and storing petroleum products. They have properties capable of helping to solve a number of important problems facing the industry.

Certain highly fluorinated organic compounds exhibit unusually low surface tensions. Added to paraffinic and aromatic hydrocarbons—in which they are relatively insoluble—these fluorocarbons will form monomolecular surface layers with their perfluoro groups outward. This decreases the hydrocarbon surface tension as much as 4-fold. The consequent behavior of the hydrocarbon verges on the spectacular, as indicated by laboratory tests.(1)

A reduction in gasoline evaporation to the atmosphere by more than 80% with no octane effect was obtained by the addition of 0.003%—only 30 ppm—perfluorooctanoic acid derivative surfactant. Xylene, benzene, and Stoddard Solvent showed similarly lowered evaporation when fluorocarbons were added.

Improved distillation efficiency by adding fluorocarbons to hydrocarbon mixture beforehand, has also been reported in laboratory results. A surface tension reduction in lubricants and greases when fluorocarbons are added may increase lubrication effectiveness and allow better penetration and surface wetting properties.

Total possibilities are not exhausted by the above. Fluorocarbon compounds used in oil base insecticides increased their "kill" effectiveness by 50%. Fluorocarbons may be used with waxes to improve their flow and impregnation properties, in coating materials to act as repellant for both oil and water, and as flotation agents.

—R.L.D.

(1) "Perfluoroalkyl Surface Active Agents for Hydrocarbon Systems," by G. B. Blake, A. H. Ahlbrecht, and H. G. Bryce, Minnesota Mining & Manufacturing Co., presented before the Division of Petroleum Chemistry, American Chemical Society, New York Meeting, Sept. 11-17, 1954.

Burn Low Grade Fuels – Efficiently . . .

The Ljungstrom operates on the continuous regenerative counter-flow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves, the heat is transferred from the waste gases to the incoming cold air.

. . . with a LJUNGSTROM *air* PREHEATER

Low grade tars, pitches and asphalts used to be considered so low in recoverable heat value that they were often discarded. But the Ljungstrom Air Preheater points the way to the practical, efficient use of these former waste products.

Preheated air is a key factor in more efficient combustion, causing faster ignition and a short, hot flame. Rates of heat liberation are higher, too. Thus, with preheated air, low grade fuels with high ash and moisture content – and excessively lean fuels – are readily burned.

You get other advantages with a Ljungstrom, too: lower fuel costs . . . more economical furnace design . . . greater throughput . . . higher product quality – *all of these with the Ljungstrom, that pays out in just a few months.*

Wherever you are planning to expand or modernize your fuel burning equipment, it will pay you to consider a Ljungstrom Air Preheater. Call or write for full information.

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WHEREVER YOU BURN FUEL, YOU NEED LJUNGSTROM

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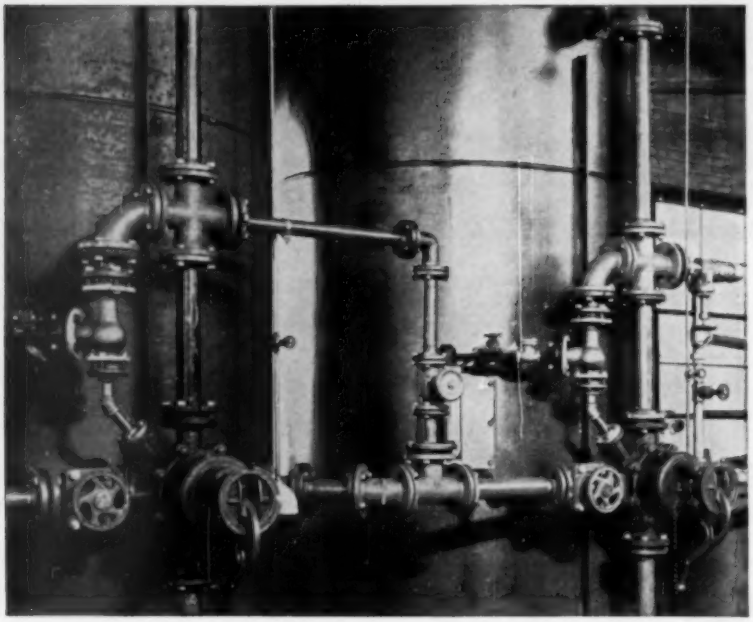
CUT CORROSION COSTS

install corrosion-resistant SARAN LINED STEEL PIPE for long, trouble-free service



Saran lined pipe, fittings and valves are used in this automatic water deionizer in a large water purification system. Installations such as this give trouble-free service for many years.

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Please send me a copy of your catalog on saran lined pipe, valves and fittings.
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Corrosion-resistant saran lined steel pipe sharply reduces repair and maintenance costs in corrosive piping installations. Downtime is cut to a minimum because this rigid pipe has high-pressure strength and durability—which mean dependable, long-term service. Easily installed saran lined steel pipe can be cut and threaded in the field—no need for special tools or handling. Wherever superior resistance to most chemicals and solvents is demanded, be sure to consider saran lined pipe, fittings and valves. THE DOW CHEMICAL COMPANY, Midland, Michigan.

RELATED SARAN PRODUCTS
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Letters

Statistics—Yes or No?

TO THE EDITOR: "Statistics—Handle With Care" by Dr. V. A. Kalichevsky seems to have transformed the editorial page of PETROLEUM PROCESSING [August, 1954, p. 1292] into a gripe section through misinformation or ignorance of the subject. I hope that the editors do not subscribe to such tenets as proclaimed in this editorial. I agree that much is made of statistical methods these days and I do question some of their uses.

However, I should like to point out a few errors, actual and implied, made by the author. ". . . estimating the average error using the square root instead of arithmetical averages . . ." is an erroneous statement. Firstly, average error is unnecessary. Secondly, it is calculated and not estimated—there is a difference. Finally, arithmetical average is an important function of statistics and should not be overlooked.

It is true that anything can be proven statistically, regardless of the significance of the data. However, only naive or misinformed persons would attempt to use statistics for anything and everything and then evalute such data. This is the case in the article "Can Statistics Do Everything?" by Mr. Robert Bradley and Irving W. Skaar [August, 1954, pp. 1208-1211]. Of course it failed—it was improperly applied and evaluated. The multiple correlation coefficient 0.92 is not almost a perfect correlation but just a little better than half a perfect correlation which states that in 6 out of 10 cases the calculated data will agree with plant data 95% of the time. This corresponds to the two out of three expected cases with the 0.92 correlation coefficient mentioned in the article.

If all that is of interest is a manipulated distribution curve, then statistics should be left alone. The example in the editorial is unfortunate because the use of statistical methods does not preclude the possibility of chance in the original data. It is not intended for such a purpose. Using irrelevent information to make decisions is ridiculous whether or not statistics is used.

I find that those who misuse statistics most are our highly trained scientists. To them a correlation is determining two or three points as "X" and "Y" references and drawing a curve on graph paper. Forecasting is then done by determining points

on either axis and plotting this data on the curve. Information is then "correlated." I can furnish other illogical and improper uses of statistics.

I can assure Dr. Kalichevsky that, properly used, statistics is not a lazy man's tool, nor does it stifle our mental processes, nor eliminate individualism.

The tone of the whole article causes me to question the uses to which statistics has been applied. Misuse of a tool does not justify elimination, else we all would have to return to the Dark Ages as far as progress and our standard of living are concerned.

Statistics is not a cure-all; it was not designed as a cure-all, nor should it be used as a cure-all.

EDWARD J. WALICHOWSKI
Industrial Engineer
Houston, Texas

• *Although not statisticians, the editors of* PETROLEUM PROCESSING *must admit that both camps in this controversy have points. Meanwhile, our own point has been demonstrated—there is interest in statistics.*

Mexican Sulfur Plant

TO THE EDITOR: I read your interesting article on Sulfur in your September issue, p. 1404, and I think our Sulfur Plant is worth one word about it.

It is the second largest in the world and produces 120 tons per day. It will possibly be enlarged to produce 200 tons per day.

A very complete history on this plant appeared in an article by S. Schwartz, "Sulfur Recovery Plant," *Petroleum Refiner*, Vol. II, p. 95, Feb. 1953, p. 95.

By the way, may I say that this plant has been for a long time "the largest sulfur producing plant," because the Worland (Wyo.) plant was not operating.

THOMAS GARCIA B.
Chief Chemist
Lab. TUGN
Petroleos Mexicanos
Poza Rica, Ver. Mexico

• *(1)* PETROLEUM PROCESSING *also carried a very complete article on the Pemex Poza Rica plant, in its March 1953 issue, p. 389—written by Dave Thornton, our Southwestern Editor, after spending six weeks in Mexico studying Pemex operations first hand. (2) Texas Gulf Sulphur Co. denies that its plant at Worland has not been operating.*

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Fast, Easy, Trouble-Free

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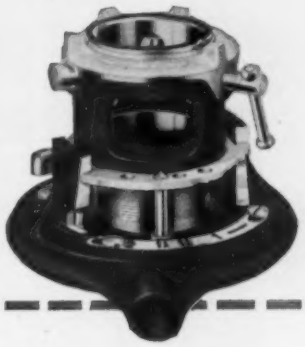
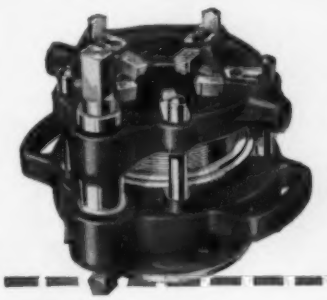
RIDGID 65R

Threads 1" to 2" pipe with 1 set of dies —and it won't jam. Sets to pipe size in 10 seconds! Workholder sets to size instantly. 65R's great popularity has been earned on thousands of tough jobs.





RIDGID 4P

For 2½" to 4" pipe—4 sets of 5 dies. Loop handles make it easy to carry, put on pipe. Workholder sets easily to size *before* putting on pipe. Easy upkeep, oilless bronze bearings.

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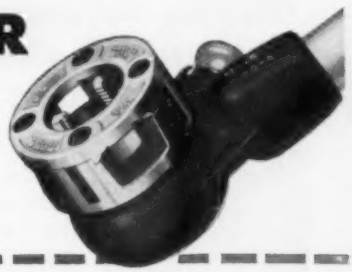
Drop-head dies, ⅛" to 1", snap into drive ring, can't fall out. Dies reverse for close-to-wall threads—no special dies needed. Other sets in any combination of sizes from ⅛" to 2".



For perfect threads with most speed and ease, ask your Supply House for RIDGID's.

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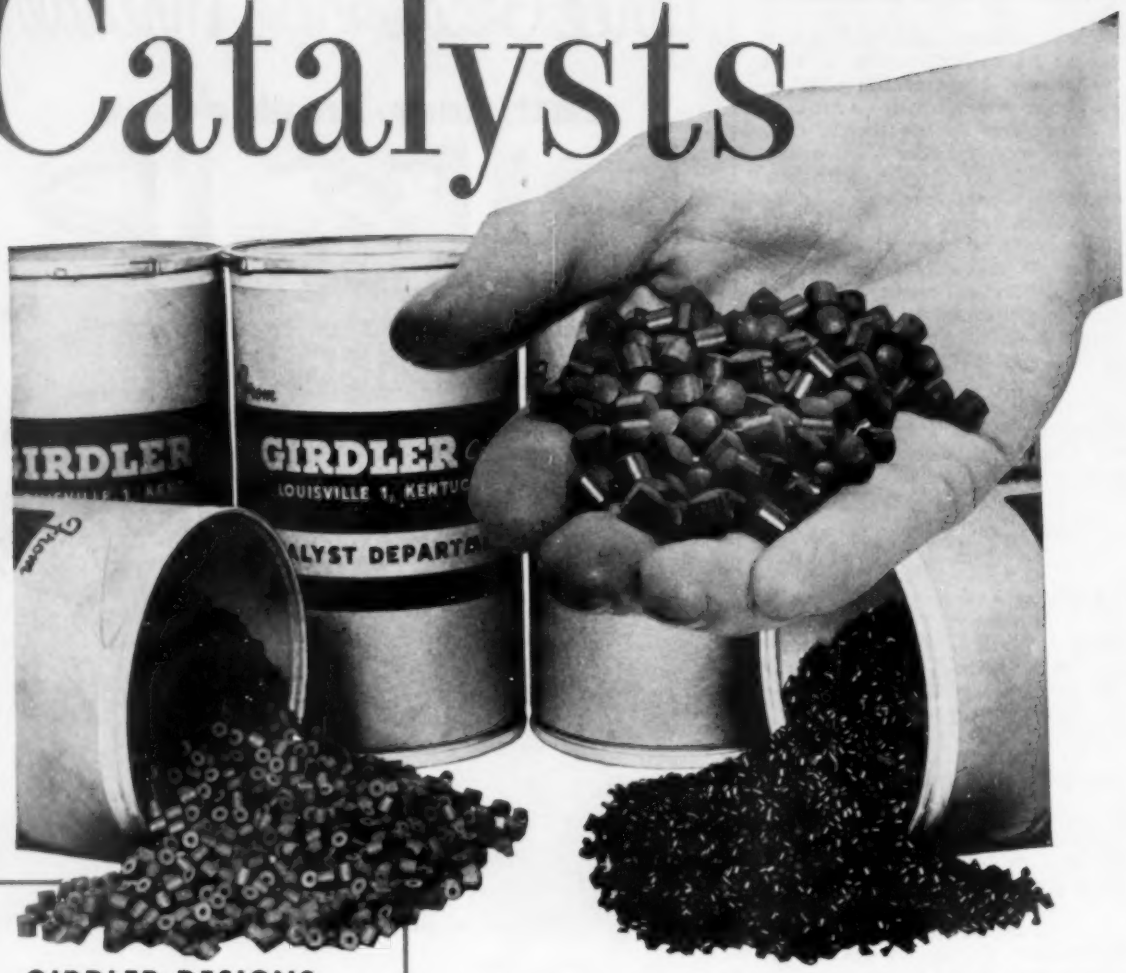
Work-Saver Pipe Tools

Catalysts



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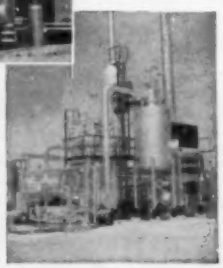

...FOR recovery of sulphur from hydrogen sulphide

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HIGH QUALITY Girdler catalysts enjoy industry-wide recognition as the answer to many tough catalyst problems. Girdler manufactures many types of catalysts for a wide range of processing applications. Our experienced catalyst technicians are well-qualified to work with you to prepare catalysts to meet your specifications. Or, if preferred, we will take your formulae and *tailor-make* catalysts to *your* exact requirements.

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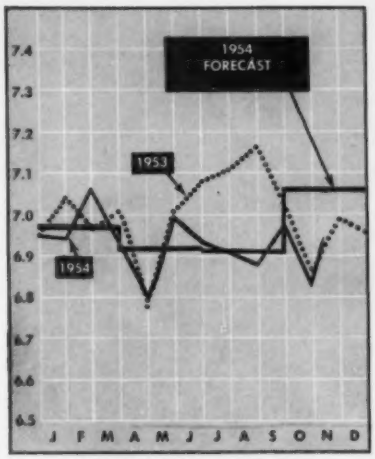
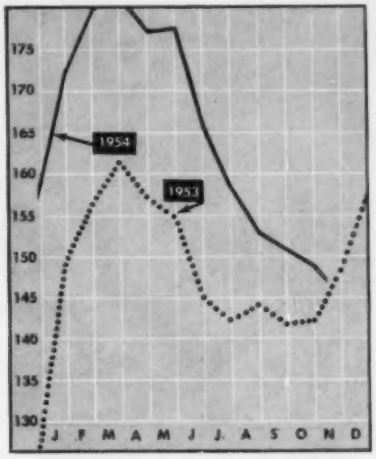
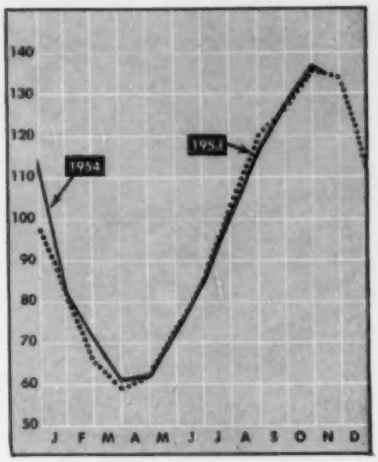


CRUDE RUNS TO STILLS
(Millions of b/d, monthly averages)



PRIMARY GASOLINE STOCKS
(Millions of bbls., end of month)



PRIMARY DISTILLATE STOCKS
(Millions of bbls., end of month)

Higher Runs or Shifts in Yields?

OUTLOOK: Higher crude runs in December are indicated.—Gasoline stocks may top 160,000,000 by Dec. 31.—Heavier shipments of heating oils in coming weeks should improve demand for middle distillates.

Signs point to a sustained higher operating rate for U. S. refineries, in preparation for the increased demand for heating oils and gasoline forecast for the winter. Crude runs for 10 months have been below those of 1953, while product demand has been only a little larger than last year, but in November was picking up.

A straw in the wind on crude runs is the setting of the Texas allowable production for December 64,300 b/d higher than November, the second consecutive month the allowable has been raised.

Increasing product supply by charging more crude to stills, rather than by improving distillate yields as far as possible, would soon make itself felt in refiners' gasoline inventories, where the trend this summer has been toward a better balance with supply and demand. Inventories Oct. 31, 149,600,000 bbls., were only 7,200,000 bbls. above the same date in 1953.

In November and December a year ago, gasoline stocks built up by 15,450,000 bbls. and on Dec. 31 were 157,872,000 bbls. This rate of increase this year would bring the U. S. total to the topheavy figure of 165,000,000 bbls.

Middle distillate inventories built up this summer by a few million barrels more than in 1953, in spite of the lower volume of crude charged to refinery stills. For the U. S. on Oct. 31, they were 175,300,000 bbls. 1.3% larger than on the same date in 1953. East of California the situation is even better. Oct. 31 stocks were 2.2% larger than the year before, mainly in the tanks of inland refineries.

Middle distillate stocks are at a point where, if the need arises early this winter, they can be reduced considerably below last year's levels without dislocating supplies, except possibly in the East Coast district. Further supplies for late winter needs can be met by increasing refinery output. To the extent this is is done by increasing distillate yields, rather than entirely by running more crude to stills, additions to already topheavy gasoline stocks can be limited.

KEY STATISTICS

(Figures given in terms of millions of b/d, monthly averages, except stocks, which are in millions of bbls. at end of month)

	Nov. 1954*	Oct. 1954	Nov. 1953
CRUDE OIL			
U. S. Production	6.229	6.170	6.277
Imports	.686	.660	.648
U. S. Stocks	269.679	271.930	283.021
Runs to Stills	6.947	6.838	6.987
GASOLINE			
Refinery Output	3.377	3.343	3.444
Refinery Demand	3.603	3.510	3.335
Primary Stocks	147.224	149.603	148.589
MIDDLE DISTILLATES			
Refinery Output	1.910	1.831	1.785
Refinery Demand	2.104	1.529	1.941
Primary Stocks	171.508	175.229	168.716
RESIDUALS			
Refinery Output	1.130	1.045	1.223
Imports	.392	.369	.433
Total Supply	1.522	1.414	1.656
Refinery Demand	1.550	1.416	1.654
Primary Stocks	55.872	56.414	51.267

*Through Nov. 19, except Crude Stocks, which are B. of M. data one day later.

PRODUCT AND CRUDE PRICES

Products—¢ gal., weighted average prices in principal refinery markets
Crudes—$/bbl., principal fields
Source—Platt's Oilgram Price Service

	Nov. 1954*	Oct. 1954	Nov. 1953
Gasoline	11.24	11.28	12.36
Distillates	8.90	8.87	9.04
Kerosine	10.42	10.37	10.39
Residuals	4.06	3.98	4.12
Above 4 Products	8.69	8.69	9.29
Lube Oils	16.30	16.24	18.34
Crude	2.81	2.81	2.83

REFINERY YIELDS

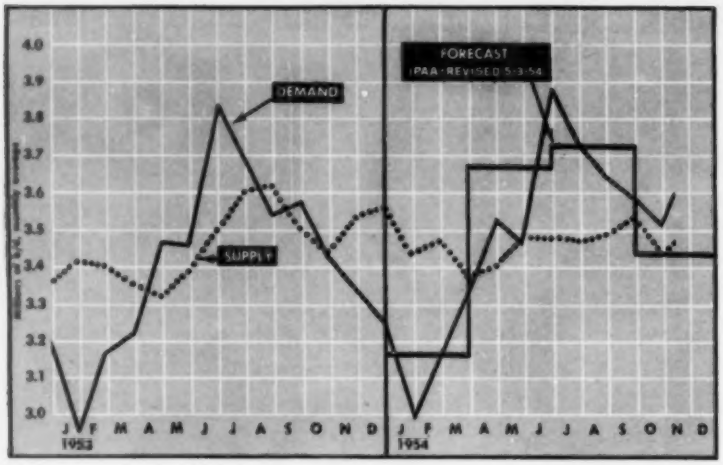
% on Crude Runs to Stills

	Nov. 1954*	Oct. 1954	Nov. 1953
Gasoline	43.4	43.7	44.4
Kerosine	4.8	4.6	4.8
Distillates	22.7	22.2	20.7
Residuals	16.3	15.3	17.5

*Through Nov. 19.

SOURCE OF DATA (except prices): Sept., Oct. and Nov., API weekly reports; earlier months, Bureau of Mines

Pickup in November Gasoline Demand

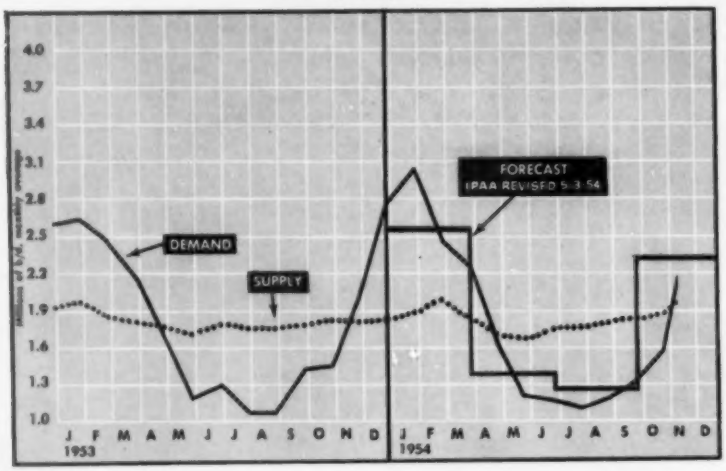


MOTOR FUELS

	From Crude	From Nat. Gas	Total
SUPPLY (Millions of b/d)			
Nov. '54*	3.016	.462	3.478
Nov. '53	3.106	.430	3.536
Change	—.090	+.032	—.058
% Change	—2.9	+7.4	—1.8
DEMAND (including Exports) (Millions of b/d)			
Nov. '54*			3.603
Nov. '53			3.335
Change			+.268
% Change			+8.0
TOTAL SUPPLY (Millions of bbls.)			
10 Mos. '54	924.218	127.386	1,051.604
10 Mos. '53	932.319	118.415	1,050.734
Change	—8.101	+8.971	+.870
% Change	—0.9	+7.6	+0.1
TOTAL DEMAND (Millions of bbls.)			
10 Mos. '54			1,060.593
10 Mos. '53			1,043.425
Change			+17.168
% Change			+1.6

*Through Nov. 19 only; may not be indicative of the trend for the entire month.

Sharp Upturn in Middle Distillate Demand

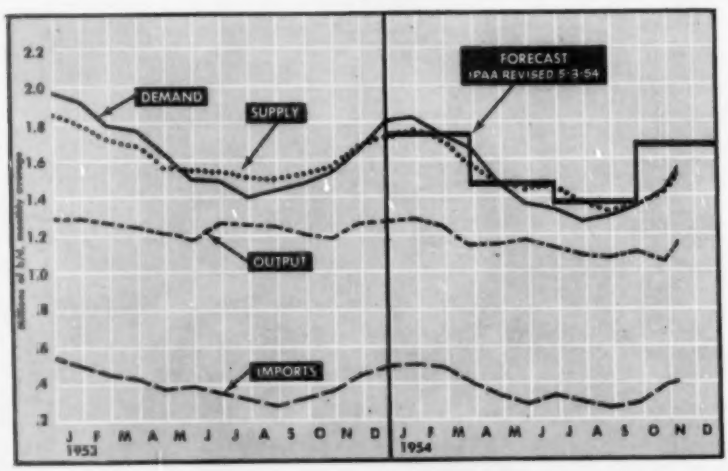


MIDDLE DISTILLATES

	Kerosine	Dist. Fuels	Totals
PRODUCTION (Millions of b/d)			
Nov. '54*	.336	1.574	1.910
Nov. '53	.334	1.451	1.785
Change	+.002	+.123	+.125
% Change	+0.6	+8.5	+7.0
DEMAND (including Exports) (Millions of b/d)			
Nov. '54*	.444	1.660	2.104
Nov. '53	.402	1.539	1.941
Change	+.042	+.121	+.163
% Change	+10.4	+7.9	+8.4
TOTAL PRODUCTION (Millions of bbls.)			
10 Mos. '54	101.060	439.416	540.476
10 Mos. '53	101.945	440.196	542.141
Change	—.885	—.780	—1.665
% Change	—0.9	—0.2	—0.3
TOTAL DEMAND (Millions of bbls.)			
10 Mos. '54	91.471	417.247	508.718
10 Mos. '53	91.472	408.704	500.176
Change	—.001	+8.543	+8.542
% Change	—	+2.1	+1.7

*Through Nov. 19 only; may not be indicative of the trend for the entire month.

Shipments of Residual Fuels Higher



RESIDUAL FUELS

	Refinery Output	Imports	Total
SUPPLY (Millions of b/d)			
Nov. '54*	1.130	.392	1.522
Nov. '53	1.223	.433	1.656
Change	—.093	—.041	—.134
% Change	—7.6	—9.5	—8.1
DEMAND (including Exports) (Millions of b/d)			
Nov. '54*			1.550
Nov. '53			1.654
Change			—.104
% Change			—6.3
TOTAL PRODUCTION (Millions of bbls.)			
10 Mos. '54	346.050	104.064	450.114
10 Mos. '53	374.643	108.118	482.761
Change	—28.593	—4.054	—32.647
% Change	—7.6	—3.8	—6.8
TOTAL DEMAND (Millions of bbls.)			
10 Mos. '54			446.721
10 Mos. '53			485.446
Change			—38.725
% Change			—8.0

*Through Nov. 19 only; may not be indicative of the trend for the entire month.

SOURCE OF DATA: Sept., Oct. and Nov., API weekly reports; earlier months, Bureau of Mines

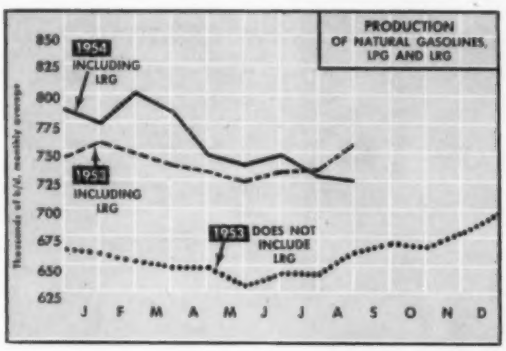
RUNS TO STILLS and DISTRIBUTION OF PRIMARY STOCKS BY U.S. REFINERY DISTRICTS

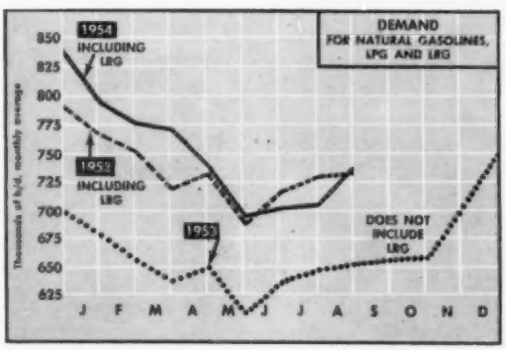
(Primary stocks include those at refineries, at large terminals and in pipelines; all data based on API reports)

District	RUNS TO STILLS (Millions of b/d average for week ending on date shown) Nov. 12 1954	Nov. 13 1953	Change	% Change	GASOLINE STOCKS (Millions of bbls., on date shown) Nov. 12 1954	Nov. 13 1953	Change	% Change	RESIDUAL STOCKS (Millions of bbls., on date shown) Nov. 12 1954	Nov. 13 1953	Change	% Change
East Coast	.966	1.044	— .078	— 7.5	34.297	33.274	+1.023	+ 3.1	10.635	12.633	—1.998	—15.8
Gulf Coast	2.304	2.194	+ .110	+ 5.0	29.428	27.284	+2.144	+ 7.8	6.740	8.371	—1.631	—19.5
Total Coastal	3.270	3.238	+ .032	+ 1.0	63.725	60.558	+3.167	+ 5.2	17.375	21.004	—3.629	—17.3
Appalachian	.155	.207	— .052	—25.1	6.605	5.803	+ .802	+13.8	.857	.958	— .101	—10.5
Ind.-Ill.-Ky.	1.272	1.350	— 0.78	— 5.8	31.470	27.944	+3.526	+12.6	4.245	4.689	— .444	— 9.5
Okla.-Kans.-Mo.	.582	.593	— .011	— 1.9	12.927	14.649	—1.722	—11.8	1.364	1.285	+ .079	+ 6.1
Other Inland	.547	.540	+ .007	+ 1.3	14.816	13.990	+ .826	+ 5.9	2.201	2.625	— .424	—16.2
Total Inland	2.556	2.690	— .134	— 5.0	65.818	62.386	+3.432	+ 5.5	8.667	9.557	— .890	— 9.3
Total East of Calif.	5.826	5.928	— .102	— 1.7	129.543	122.944	+6.599	+ 5.4	26.042	30.561	—4.519	—14.8
California	1.057	1.023	+ .034	+ 3.3	18.353	19.892	—1.539	— 7.7	30.026	21.135	+8.891	+42.1
Total U.S.	6.883	6.951	— .068	— 1.0	147.896	142.836	+5.060	+ 3.5	56.068	51.696	+4.372	+ 8.5

District	DISTILLATE STOCKS (Millions of bbls., on date shown) Nov. 12 1954	Nov. 13 1953	Change	% Change	KEROSINE STOCKS (Millions of bbls., on date shown) Nov. 12 1954	Nov. 13 1953	Change	% Change	TOTAL MIDDLE DISTILLATE STOCKS (Millions of bbls., on date shown) Nov. 12 1954	Nov. 13 1953	Change	% Change
East Coast	52.132	50.720	+1.412	+ 2.8	14.646	15.358	— .712	— 4.6	66.778	66.078	+ .700	+ 1.1
Gulf Coast	22.353	24.165	—1.812	— 7.5	7.315	6.067	+1.248	+20.6	29.668	30.232	— .564	— 1.9
Total Coastal	74.485	74.885	— .400	— 0.5	21.961	21.425	+ .536	+ 2.5	96.446	96.310	+ .136	+ 0.1
Appalachian	3.549	2.443	+1.106	+45.3	1.222	1.307	— .085	— 6.5	4.771	3.750	+1.021	+27.2
Ind.-Ill.-Ky.	25.604	24.256	+1.348	+ 5.6	9.575	9.534	+ .041	+ 0.4	35.179	33.790	+1.389	+ 4.1
Okla.-Kans.-Mo.	12.955	12.354	+ .601	+ 4.9	2.339	2.083	+ .256	+12.3	15.294	14.437	+ .857	+ 5.9
Other Inland	6.090	6.322	— .232	— 3.7	1.369	1.476	— .107	— 7.2	7.459	7.798	— .339	— 4.3
Total Inland	48.198	45.375	+2.823	+ 6.2	14.505	14.400	+ .105	+ 0.7	62.703	59.775	+2.928	+ 5.0
Total East of Calif.	122.683	120.260	+2.423	+ 2.0	36.466	35.825	+ .641	+ 1.8	159.149	156.085	+3.064	+ 2.0
California	13.476	14.272	— .796	— 5.6	.309	.411	— .102	—24.8	13.785	14.683	— .898	— 6.1
Total U.S.	136.159	134.532	+1.627	+ 1.2	36.775	36.236	+ .539	+ 1.5	172.934	170.768	+2.166	+12.6

Natural Gas and Refinery Gas Liquids





SUPPLY AND DEMAND STATISTICS

(Bureau of Mines Data)

CURRENT PRODUCTION (1000 b/d monthly average)	Aug. 1954	July 1954	Aug. 1953
At Natural Gasoline and Cycling Plants			
Liquefied Petroleum Gas	289	286	302
Natural Gasoline and Isopentane	272	273	271
Condensate	25	24	24
Finished Gasoline, Naphtha and Others	56	59	68
Total Natural Gasoline and Cycling Plant Production	642	642	665
Liquefied Refinery Gases	88	92	95
Total Marketable Gas Liquids	730	734	760
Lease Condensate	94	100	88
Total Natural Gas Liquids	824	834	848
CURRENT DEMAND (1000 b/d monthly average)			
LPG and LRG	363	362	371
Natural Gasoline, Isopentane and Other	376	344	366
Total Current Demand	739	706	737

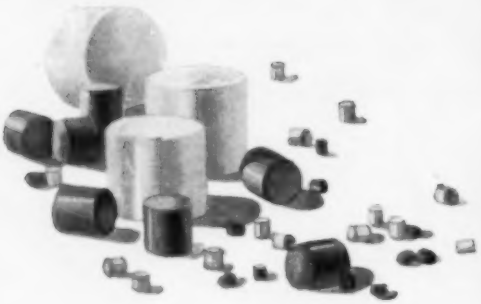
CUMULATIVE PRODUCTION (1000 bbls.)	Aug. 1954	Aug. 1953
LPG and LRG	99,655	96,028
Natural Gasoline, Isopentane and Other	85,118	85,081
Total Marketable Gas Liquids	184,773	181,109
CUMULATIVE DEMAND (1000 bbls.)		
LPG and LRG	94,550	92,344
Natural Gasoline, Isopentane and Other	85,435	85,202
Total Cumulative Demand	179,985	177,546

STOCKS (1000 bbls., end of Month)	Aug. 1954	July 1954	Aug. 1953
LPG and LRG	9,581	9,123	4,781
Natural Gasoline, Isopentane and Other	4,572	5,306	4,959
Total Stocks	14,153	14,429	9,740

HARSHAW'S

Continuous Research Develops

stronger *tableted* catalysts



THE HARSHAW CHEMICAL COMPANY

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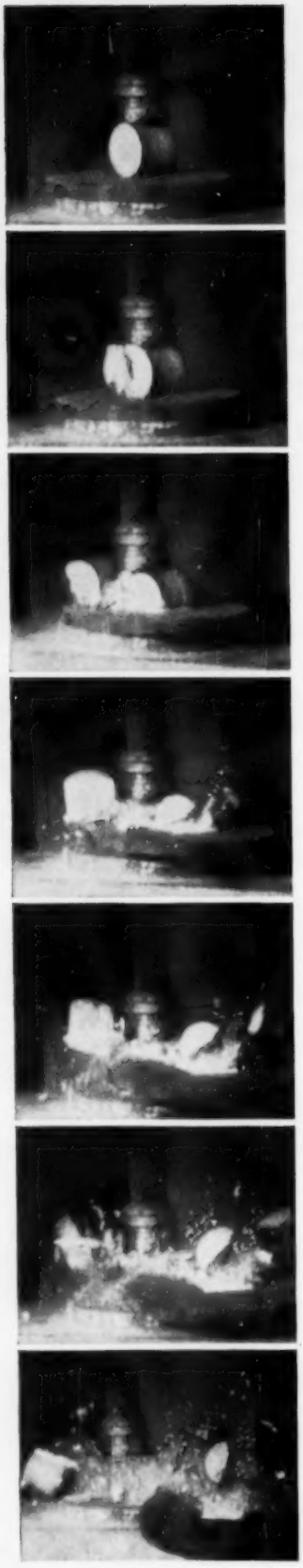

Taken at 1/20,000th of a second, the pictures show a Harshaw catalyst tablet being tested for strength—one step in our research program designed to produce more efficient tableted catalysts having the highest useful strength. Our goal, of course, is to make the catalyst you want and need. First you specify, and then we produce.

Tougher, more efficient catalysts mean fewer reactor shutdowns, and, naturally, more economic operation for you. Harshaw Catalysts mean fewer reactor shutdowns.

If your mind's on catalysts please contact us today by phone or letter.

HARSHAW CATALYSTS
available in these forms:

Tablets	Powders
Extrusions	Spheres
Granules	Rings
Flakes	

DU PONT
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PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT
REG. U. S. PAT. OFF.

December ★ One of a Series of Interest to the Petroleum Industry ★ 1954

Two New Type Lube Oil Additives Developed by Du Pont

New polymeric additives offer low-cost solution to sludge problems resulting from low-duty engine operation

Since sludge deposits caused by stop-and-go driving are a major problem in the average passenger car, two new Du Pont lube oil additives can give you a tremendous sales advantage in the motor oil market by overcoming this widespread trouble. They also offer outstanding advantages to operators of urban taxi, bus and truck fleets.

Sludge problems in the making! Stop-and-go city driving conditions like this are a major cause of engine sludge.

The two new additives are *Du Pont Lube Oil Additive 564* and *Du Pont Lube Oil Additive 565*. Both are polymeric additives with outstanding detergency and varying in shear stability and viscosity-index improving properties.

Double-action

These two-way detergent and V. I. improving addi-

OVER

Unique Spectrometer Traces Little Known Reactions Leading to Knock

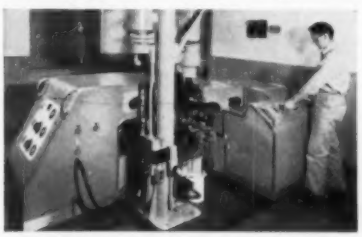
At the Du Pont Petroleum Laboratory, new light is being focused on happenings in the combustion chamber.

Research scientists using a new spectrometer are now able to study, as never before, what goes on in the combustion chamber just before knock.

The apparatus, which was developed for the Petroleum Laboratory, is built around a single-cylinder engine. Light is passed through windows in opposite sides of the combustion chamber—in one window and out the opposite. The engine is operated in such a way as to cause the reactions leading to knock to take place throughout the entire combustion chamber rather than, as is normally the case, in only a small portion of the chamber.

Electrical Impulses

As the light passes through the mixture in the engine some of its energy is ab-



sorbed by the chemicals present in the combustion chamber. The light leaving the engine is converted into electrical impulses for automatic recording on a strip chart. Combustion chamber windows of quartz, rock salt and lithium fluoride make it possible to cover the ultraviolet visible and infrared regions.

Because each chemical reaction in the chamber varies the amount of light that gets through at different wave lengths, the spectrometer can make a record—automatically—of changes taking place within the chamber.

First of its kind

This is the first spectrometer of its kind. And it is being used exclusively to determine what causes knock and how tetraethyl lead and other materials react in the fuel to prevent it. From equipment such as this, it is hoped, new ways of suppressing knock will be discovered. Already the spectrometer is beginning to yield valuable information on hydrocarbon radicals formed under pressure in the combustion chamber—and their role in knock.

When final results of these tests have been analyzed, findings will be published and made available to the petroleum and automotive industries.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *New Additives*

tives are economical and exceptionally effective in retarding sludge formations caused by low-power, low-temperature and other driving conditions. Thus, they help to maintain good engine lubrication and to extend the useful life of the engine.

Reduces sludge

These ashless polymeric lube oil additives maintain more efficient operation of the engine oil system. Oil screens, filters and oil lines are kept clean and sludge-free. And the resulting free flow of oil through the engine keeps it in better operating condition.

Cost less than other detergents

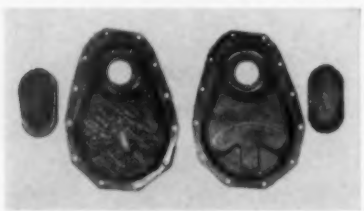
The new Du Pont polymeric lube oil additives are effective in low concentrations. This, combined with their two-way detergent–V. I. improver action, means lower cost manufacture of multi-graded oils of superior performance.

Test results

To test the effectiveness of *Du Pont Lube Oil Additive 564*, a fleet of taxicabs was run for 50,000 miles of low-duty service. Factory-new engines were installed in all cabs at the beginning of the test, with oil-drain periods established at 4500 to 5000 miles.

Some of the test cars were operated with a representative heavy-duty motor oil (For Services MS and DG). Others were operated with the same base oil to which *Du Pont Lube Oil Additive 564* and an antioxidant had been added.

The results of this test are shown clearly in the following photographs.



NOTICE THE DIFFERENCE in sludge on the oil screen and timing gear cover on the left as compared to the clean appearance of the corresponding parts at the right. Those on the left were operated on a representative heavy-duty motor oil (For Services MS and DG). The cleanliness of those on the right resulted from the use of the same base oil to which Du Pont Lube Oil Additive 564 and an antioxidant had been added.

Continued—bottom of next column

ASSISTANT EASTERN REGION MANAGER

WESLEY T. DORSHEIMER was recently named Assistant Manager, Eastern Region, by the Du Pont Petroleum Chemicals Division. Prior to this appointment he had served as an Account Manager of the Eastern Region.

He joined the Du Pont Company in 1952 as a sales-service representative in the Petroleum Chemicals Division. He started his career as an engineer in the Technical Service Division of the Esso Standard Oil Company at Bayway, New Jersey. He then became a sales engineer for C. F. Braun and Company in Alhambra, California. From 1948 until he joined Du Pont, he was assistant sales manager of the Chemical Industries Division of the Foxboro Company in Foxboro, Massachusetts.

Mr. Dorsheimer was graduated from Carnegie Institute of Technology with a B. S. degree in chemical engineering.

WESLEY T. DORSHEIMER

He is a member of the American Chemical Society and the American Institute of Chemical Engineers.

Du Pont Metal Deactivator Valuable Additive for Distillate Fuel Oils

When used in diesel and home heating oils, Du Pont Metal Deactivator (DMD) has *three* outstanding advantages.

1. It retards residue formation during storage. In the distribution of distillate fuels it is difficult to avoid copper contamination which accelerates oxidation reactions. This copper is rendered inactive by the addition of extremely small quantities of DMD.

2. It prevents color deterioration caused by copper catalyzed reactions.

3. It inhibits formation of copper mercaptide. Copper mercaptides formed by the reaction of mercaptans with copper or brass sometimes pose a serious problem in diesel and heating oils. They can plug filters or other parts and completely stop the flow of oil. An economical way of minimizing the harmful effects of this reaction is to deactivate the copper chemically with DMD.

Although DMD is highly effective when used alone in fuel oils, it is of maximum value when used in combination with an antioxidant and dispersant such as Du Pont Fuel Oil Additive No. 2.

Commercial quantities of both these new Du Pont additives are now available. For testing their effectiveness in your own oils, any of our regional offices listed below will be glad to arrange for free samples.

DU PONT

Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

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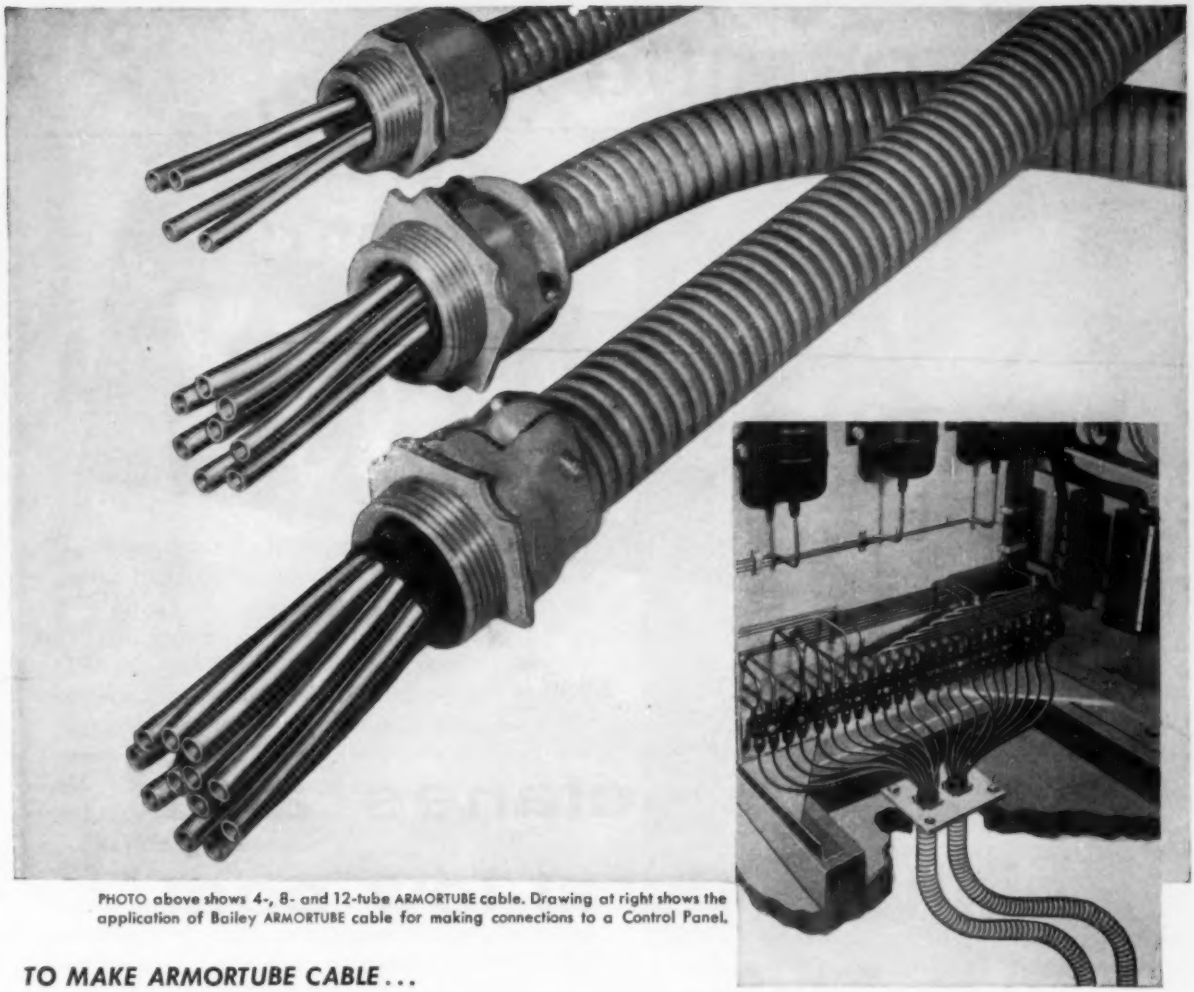


PHOTO above shows 4-, 8- and 12-tube ARMORTUBE cable. Drawing at right shows the application of Bailey ARMORTUBE cable for making connections to a Control Panel.

TO MAKE ARMORTUBE CABLE . . .

Bailey Meter Company turns to Anaconda for long lengths of ¼" O. D. copper tubes

Bailey Meter Co., Cleveland, Ohio, calls its ARMORTUBE Flexible Protected Tube Cable, "the modern shortcut to simpler, safer, more economical air and hydraulic circuits."

As shown above, this cable is available in bundles of four, eight or twelve ¼" O.D. copper tubes. A continuous, heavy galvanized steel strip protects the tube bundle.

Here's why Bailey turned to Anaconda as the logical source of supply for these ¼" O.D. copper tubes.

LONG LENGTHS

Because ARMORTUBE cable is shipped in random lengths of about 500 feet, Bailey needed long lengths of copper tube. Anaconda makes copper tube up to 2,400 feet long, depending on the diameter.

CLEAN INTERIORS

These tubes had to be free from dust, dirt or metal chips which might otherwise interfere with the operation of delicate air and hydraulic circuits. Anaconda takes special care to see that inside surfaces of ANACONDA Copper Tubes are clean, smooth and bright. Tube ends are sealed to keep out moisture and foreign matter during storage.

FLEXIBLE

Tubes had to be flexible enough to bend around corners and obstacles. ANACONDA Copper Tubes are uniformly soft . . . highly flexible. And they are accurate in size and shape.

ANACONDA Dehydrated Copper Tubes are made in all standard sizes up to and including ⅞" O.D. Usually furnished in 25-, 50- and 100-foot coils, they are also available in longer lengths on spools and reels where required.

Our Technical Department will be happy to lend a hand on any problem involving the use of copper tubes. A letter outlining your problem will bring a prompt answer. Write to: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

54158

ANACONDA®

COPPER TUBES

CATFORMING *means*

for high octanes and high yields at low cost

Simplicity is the keystone of Catforming. Why? Because simplicity takes the high cost out of high octanes and high yields.

Simplicity speeds construction of Atlantic Catforming units—saving you money and time.

Simplicity makes operation of these units easy—saving you money on operating costs and manpower as well.

Simplicity means efficiency — Catforming cuts out intermediate steps in processing feed stocks, gives you high octane gasoline ready for immediate blending—and distribution.

Simplicity goes all the way with Catforming, including the licensing agreement—you'll find it well worth looking into. Remember, the performance of Catforming units has been proved in highly successful commercial operations in many areas. Write, wire or phone for detailed information — ask for our brochure, "CATFORMING." The Atlantic Refining Company, Research and Development Dept., P. O. Box 8138, Philadelphia 1, Pa.

ATLANTIC *It's the Catalyst that counts*

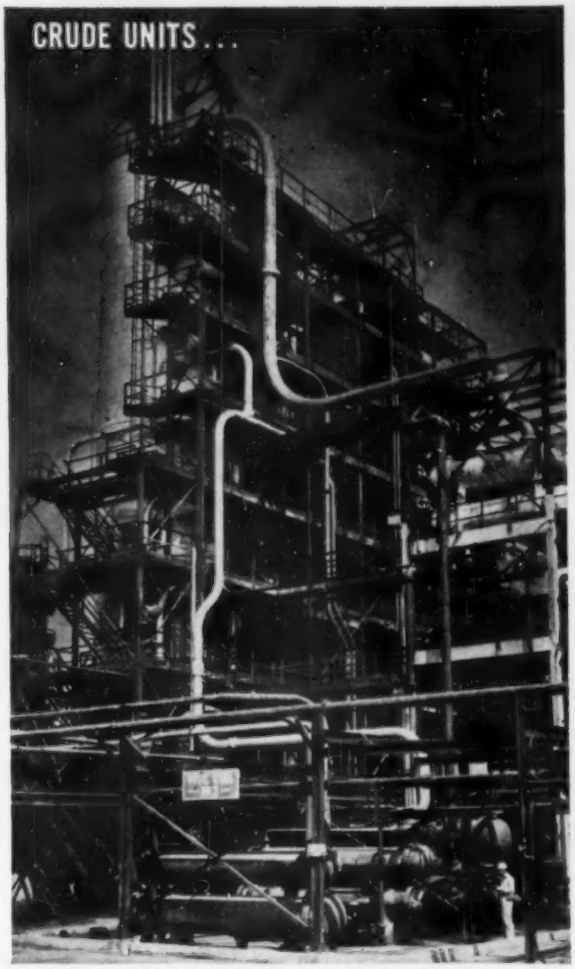
POLYRAD CONTROLS ACID CORROSION

all around the refinery

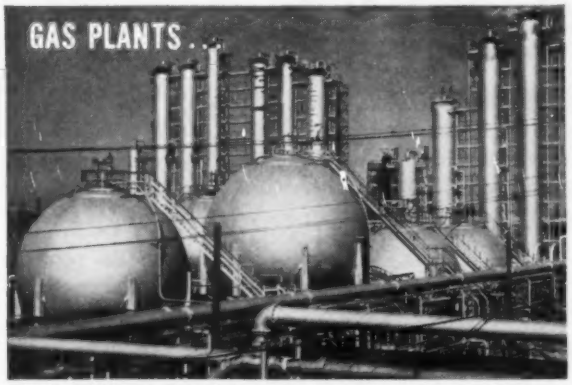
From crude units to gas plant areas, Hercules Polyrad controls corrosion, helps maintain throughput, increases heat transfer, reduces metal loss, and cuts down time for maintenance.

A filming amine inhibitor, Polyrad forms a protective molecular film that safeguards refinery equipment from hydrogen-ion attack by organic and inorganic acids. Developed through Hercules research, Polyrad was specifically designed to control corrosion at low pH and it is highly effective over the entire pH range encountered in refinery operations.

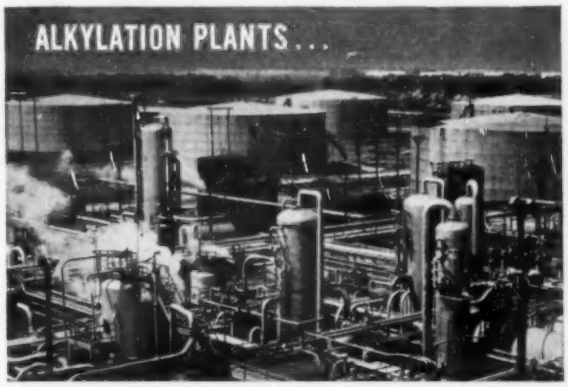
Polyrad is quickly available from stocks located strategically throughout the nation. One of our technical representatives will be glad to work with you in evaluating Polyrad under your operating conditions. For additional data, write Hercules.



A PLUS FEATURE of Polyrad through the refinery is its detergent action which loosens iron sulfide and other scales so that they can be removed in the fluid stream.



CUTS DOWNTIME—By helping to maintain throughput and reducing metal loss, Polyrad keeps down time for maintenance to a minimum any place in the refinery where acidic corrosion or fouling is a problem.



POLYRAD PROTECTS many types of refinery equipment from hydrogen-ion attack. It is useful in condensers, distillation columns, re-boilers, and heat exchangers.

Naval Stores Department

HERCULES POWDER COMPANY

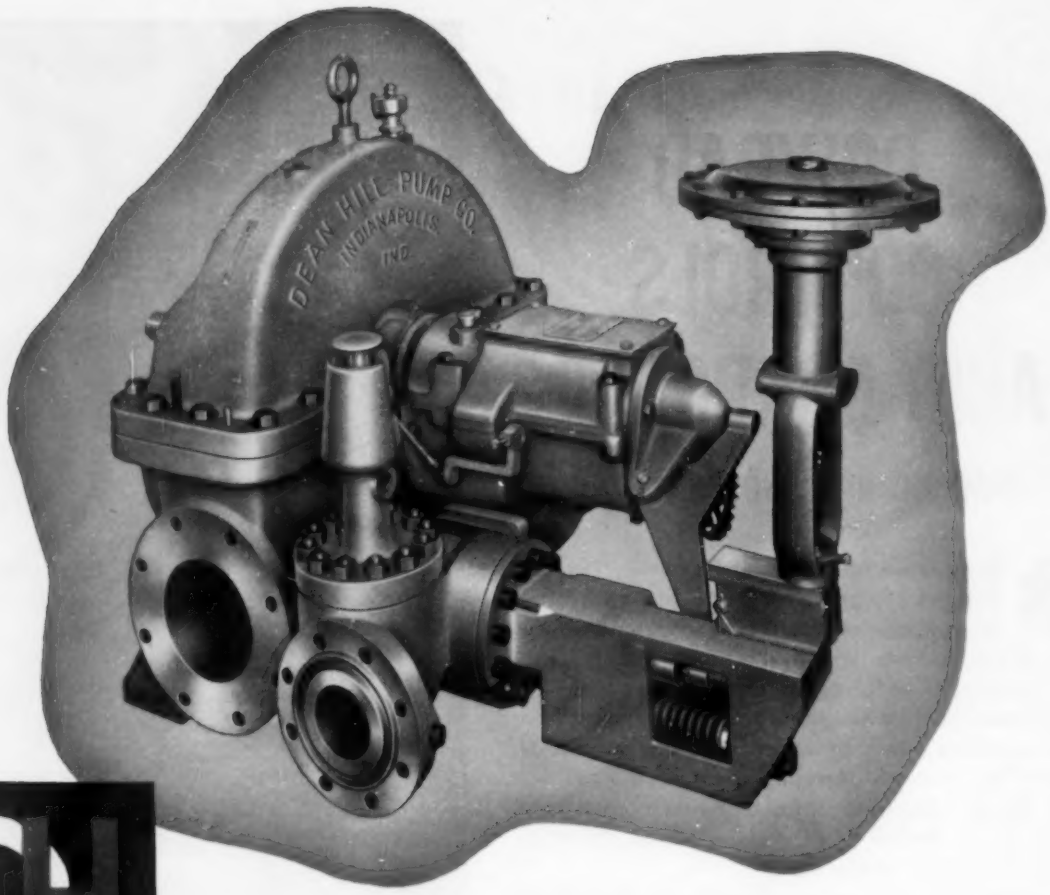
INCORPORATED

984 King St., Wilmington 99, Del.

POLYRAD®

FILMING AMINE INHIBITOR

NA54-6



D-H turbines with pressure regulators solve constant fluid pressure problems

Dean Hill Turbines equipped with pressure regulators are "made to order" for boiler feedwater applications requiring precise, automatic pressure control. Regulators can be used with any turbine model of either horizontal or vertical design and are furnished with direct-acting or remote control. They can be arranged to maintain a constant pump discharge pressure or a constant differential pressure over the boiler pressure.

The regulator controls all turbine speeds up to normal rating, but above this point the turbine governor overrides the regulator to prevent overspeeding. The emergency trip valve remains independent.

To effect maximum efficiency of control and eliminate lost motion and deflection, the regulator is mounted on a rugged support made of welded six-inch channels.

For further information on D-H Turbines and optional accessories

write today for Catalog 500.

DEAN HILL PUMP COMPANY

Pump and Turbine Engineers Since 1893

Indianapolis 7, Indiana

Sales Offices In:

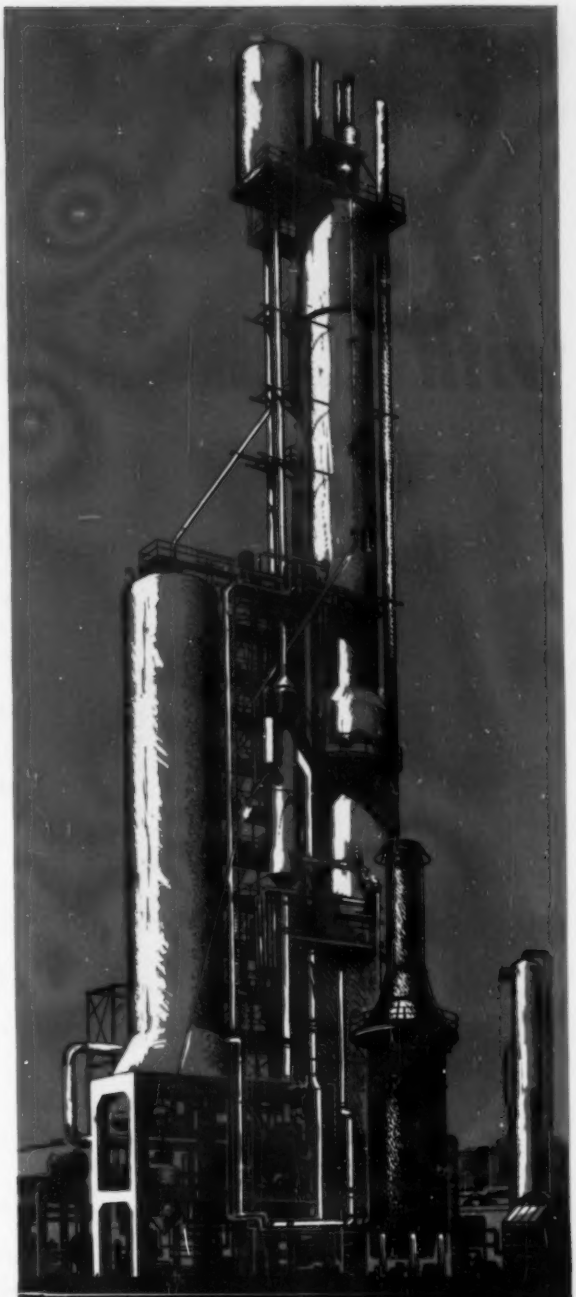
Chicago, New York, San Francisco, Boston, Cincinnati, Denver, Albuquerque, El Paso, Salt Lake City, New Orleans, Philadelphia, Tulsa, Los Angeles, Pittsburgh, Houston, Dallas, St. Paul, Toledo, Cleveland, Grand Rapids, Birmingham, Ala., Louisville, Memphis, Richmond, Mexico City, Montreal, Reading, Pa., The Hague, Washington, Charlotte, Casper, Wyo., Knoxville.

HIGHEST CONVERSION LEVELS IN REFINING HISTORY!

Extensive commercial operation of Houdriflow Catalytic Cracking units has proved that they achieve conversion rates previously unobtainable. A west Texas Houdriflow charging heavy vacuum gas oils has exceeded 90% conversion of the charge stock—a world's record. Only 3 to 4 percent of the original crude remained higher boiling than the Houdriflow charge stock.

In addition to record-breaking cracking efficiency, Houdriflow units have shown exceptional mechanical reliability. Turnarounds of units which have been on stream over two years have revealed minimum maintenance requirements.

A request on your letterhead will bring you a new brochure describing the Houdriflow process in detail. Flow diagrams and economics are included.



HOUDRY

PROCESS CORPORATION

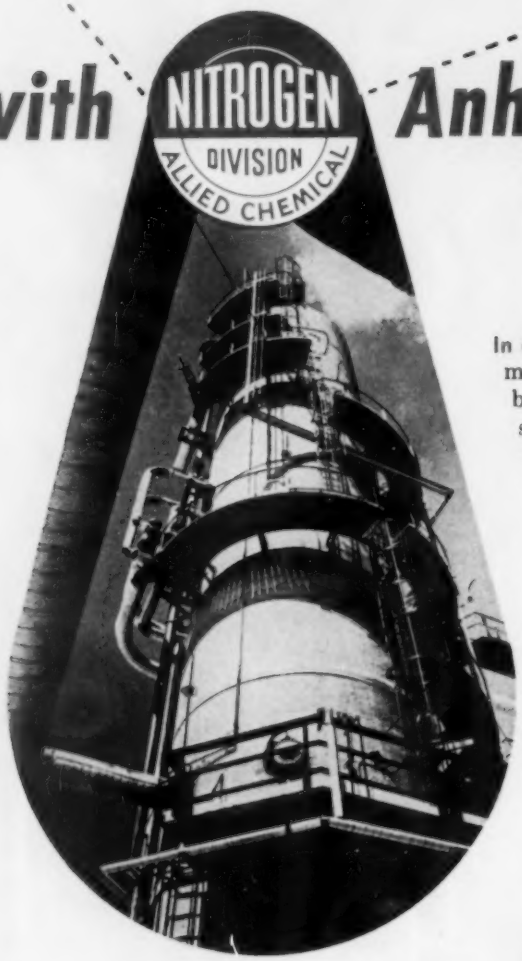
1528 Walnut Street, Philadelphia 2, Pa.

International Licensor: World Commerce Corporation, S.A.

PIONEER IN CATALYTIC PROCESSES

REDUCE CORROSION

with NITROGEN DIVISION ALLIED CHEMICAL Anhydrous Ammonia



In a typical petroleum installation, Anhydrous Ammonia reduces losses from uncontrolled corrosion by as much as 88 per cent. Operating equipment, storage tanks and pipe lines all have longer life when Anhydrous Ammonia is used to neutralize corrosive hydrogen sulfide (sour crude).

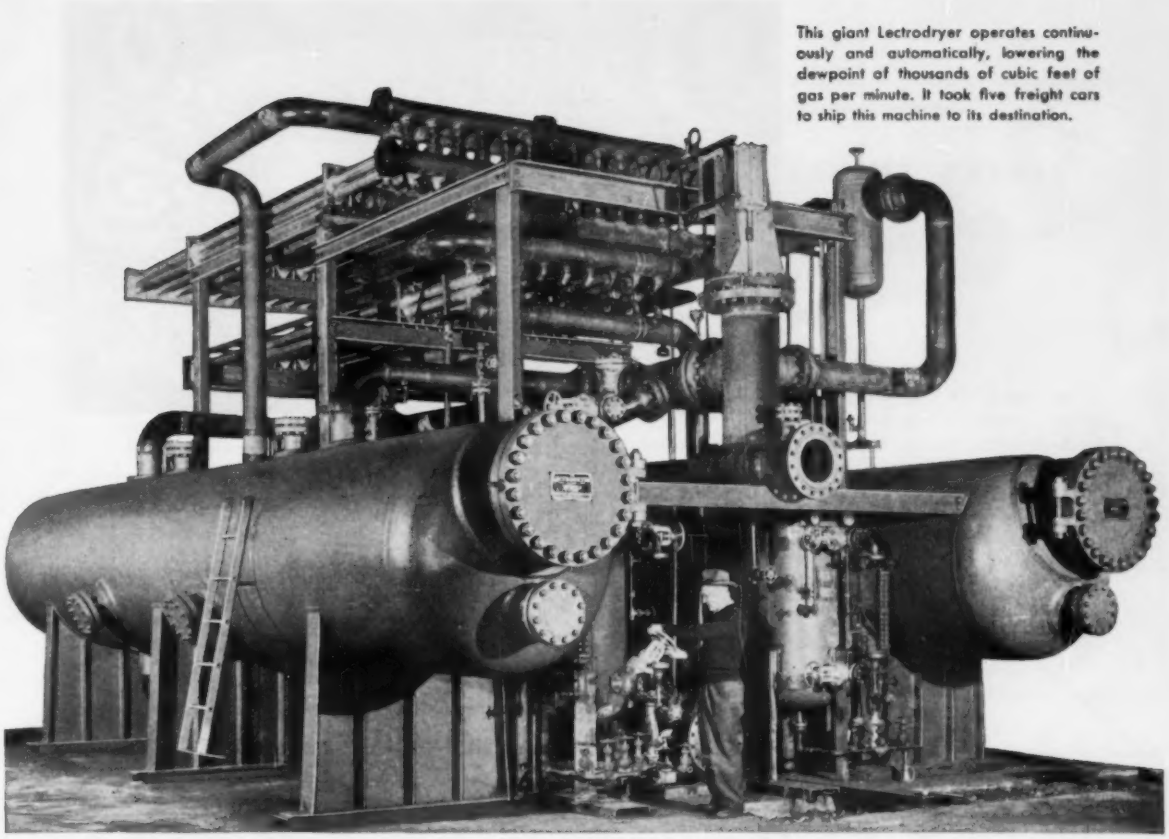
Anhydrous Ammonia is easily vaporized. It follows the gas stream through condensers, fractionating tower, heat exchangers, etc. With its high solubility and high diffusion rate it reduces acidity without forming water or undesirable emulsions. And products of neutralization are easily eliminated from the oil. Excess ammonia is removed by blowing the oil with air.

One pound of Anhydrous Ammonia will neutralize the same quantity of acid as several pounds of other anti-corrosion agents. Use of ammonia is effective under a variety of climatic and operating conditions. Especially valuable is the convenient operation with ammonia without interference with normal operating procedures of schedules.

Start now to preserve your valuable equipment. Use Nitrogen Division Anhydrous Ammonia; available in 10,000- and 12,500-gallon tank cars and in 150-, 100-, and 50-lb. cylinders. For special assistance in adapting to the Anhydrous Ammonia process call or write to your nearest Nitrogen Division office or 40 Rector St., New York 6, N. Y.

Ammonia
Sodium Nitrate
Urea
Ethylene Oxide
Ethylene Glycol
Diethylene Glycol
Triethylene Glycol
Methanol
Formaldehyde
Nitrogen Tetroxide
U.F. Concentrate–85
Nitrogen Solutions
Fertilizers &
Feed Supplements

NITROGEN DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
Ironton, Ohio • Orange, Texas • Omaha, Nebraska



This giant Lectrodryer operates continuously and automatically, lowering the dewpoint of thousands of cubic feet of gas per minute. It took five freight cars to ship this machine to its destination.

The Consulting Engineer Said, "Put A Dryer Here..."

So we did!

This huge DRYing machine grew out of that notation on a plan and a listing of requirements. That's all Lectrodryer* engineers need to design and build an efficient DRYer that will reduce dewpoints to a harmless level.

Perhaps your need for DRYness is just as acute, but you require less volume... higher or lower pressure. There probably is a Lectrodryer already designed to fit your particular process. Lectrodryers will reduce dewpoints to as low as -100°F. They can lower humidity to a low 10%. Certain types will handle pressures up to 6000 psi.

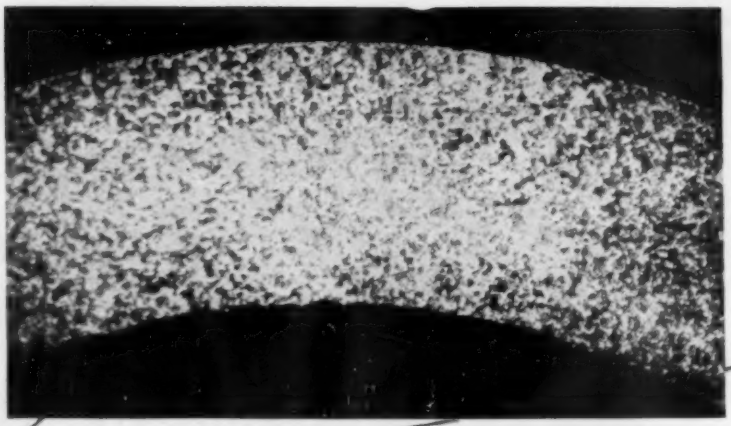
Write for *Because Moisture Isn't Pink*, a booklet describing how industry is using Lectrodryers of all types. Pittsburgh Lectrodryer Corporation, 332 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

*REGISTERED TRADEMARK U. S. PAT. OFF.



This Photomicrograph Tells the Story of WOLVERINE QUALITUBE*

The name—Qualitube—is an exact description of Wolverine's electric-welded steel tube for condensers, heat exchangers and boilers. This photomicrograph proves the point.

Shown is a cross section of the wall of Wolverine Qualitube. Careful examination shows the uniform grain structure of the steel—*right through the weld area!* Main requirements of tubing of this type are soundness of welds and resistance to corrosion. (Naturally, the weld flash is cut from the I.D. of the finished tube. The resulting smooth surface is better able to stand up under the attack of corrosive elements.)

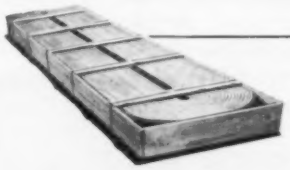
Wolverine produces Qualitube to exacting specifications, each one dependent upon its application. For example, condenser tubing is manufactured to ASTM Specification A-214. Boiler tubing is made to ASTM Specification A-178 or to ASTM Specification A-226 (for high pressure service).

Constant inspections throughout the entire fabricating operations assure that Wolverine Qualitube will meet your specifications. That quality control—plus skilled workmen and top equipment—is Tubemanship—the real difference in tubing.

Prime Surface Tubing

When picking a condenser tube, your best bet is to select tubing that is exactly right for its job. Wolverine helps you in this respect by producing several different kinds of tube. Prime surface tube, for example, is available not only in steel, but in copper, copper-base alloys, and aluminum. It is available too in a wide range of sizes.

WOLVERINE TUBE



U-BEND PALLETS

A big time-saver is Wolverine's intriguing idea of packaging U-bend condenser tubes on an expendable, box-type pallet. Wolverine uses your prints to arrange the U-bends—either plain or finned—in their exact order of installation. All you have to do is to feed them directly from pallet to condenser. You save time, storage space, inventories. It's just Tubemanship at work for you.

WOLVERINE TUBE

Wolverine's new book on condenser and heat exchanger tubes will be a valuable addition to your library. Better write for a copy—today! WOLVERINE TUBE, Division of Calumet & Hecla, Inc., 1441 Central Avenue, Detroit 9, Michigan.

*REGISTERED U.S. PATENT OFFICE

WOLVERINE TRUFIN*

WOLVERINE TRUFIN TYPE S/T condenser tubing lets you get more work—more efficiency—in the same amount of space as prime surface tubing. Trufin's integral fins resist the shock of vibration and temperature changes. You can substitute Trufin directly for prime surface tubing—roll it or braze it into headers by conventional means. Trufin is available in the same metals as plain tube with the addition of bi-metal.

WOLVERINE TUBE

Tubemanship

You'll find that Tubemanship is built in—along with complete quality control—to all Wolverine tubular products. You can get engineering and other technical help—quick answers to corrosion, alloys, heat transfer and other problems—from Wolverine's Field Engineering Service. That's the type of service that saves valuable time and money.

WOLVERINE TUBE

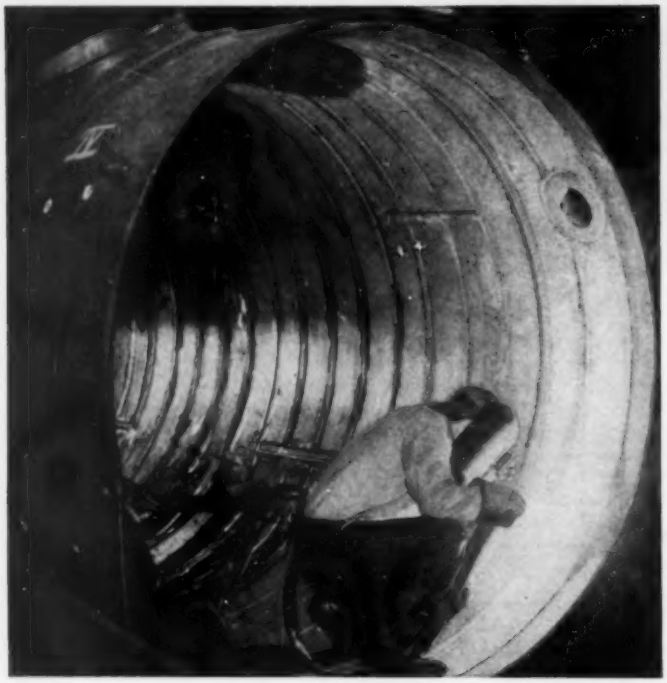
Wolverine Trufin available in Canada through the Unifin Tube Co., London, Ontario.

WOLVERINE TUBE
DIVISION OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES.

EXPORT DEPARTMENT, 11 EAST 40TH STREET, NEW YORK 16, N.Y.

Made to Last in Severe Corrosives

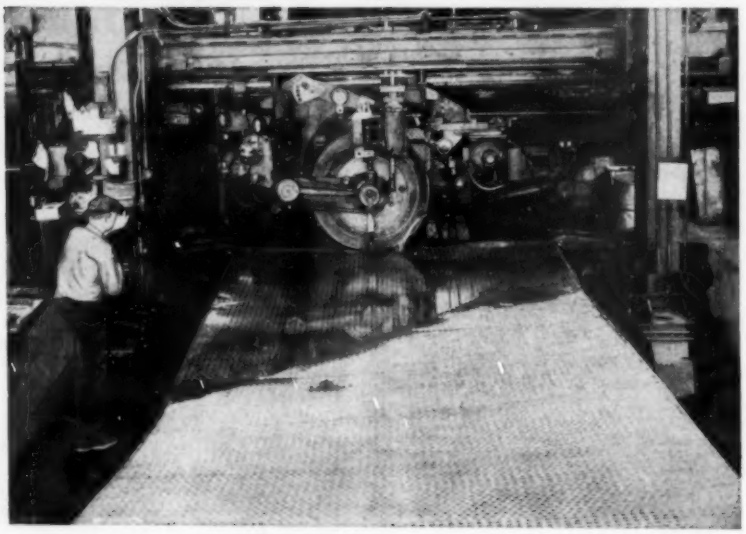


A TOWER OF RESISTANCE

Strips of HASTELLOY alloy C are being arc-welded to this 44-ft. long tower to give it added corrosion resistance. The entire inside surface of the vessel is covered with ¼-in. thick sheet.

SEALING OUT CORROSION

This lining of HASTELLOY alloy F will resist acids and alkalies. It is attached to steel by the Smithlining* spotweld process, one of the many ways of attaching HASTELLOY alloys to steel. Use of lined-sheet is an economical means of handling severe corrosives.



HASTELLOY *alloys can help solve your corrosion problems, too. For further information, contact the nearest Haynes Stellite Company office.*

*"Smithlining" distinguishes an exclusive process of the A. O. Smith Corporation, Milwaukee, Wisconsin.

HASTELLOY *alloys*
TRADE-MARK

Nickel-base, corrosion-resistant alloys available as sheet, plate, bar stock, welding rod, welded tubing and pipe, cast pipe and pipe fittings, sand and precision-investment castings.

"Hastelloy" is a registered trade-mark of Union Carbide and Carbon Corporation.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
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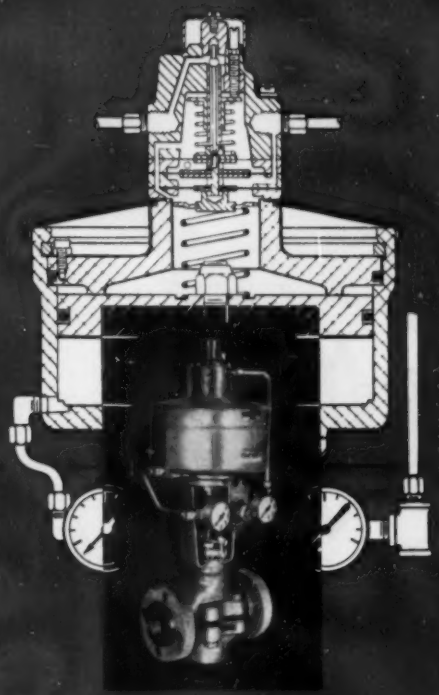
OUTMODES ALL OTHERS

for Throttling Control Service

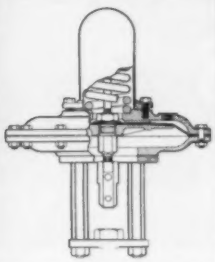
. . . CONOMOTOR SERIES LB VALVES

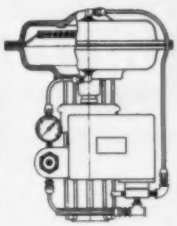


Conoflow is unbiased in evaluating the relative merits of the Cylinder Conomotor over spring-and-diaphragm and springless diaphragm motors. Conoflow makes all three. But look at the chart below . . . There's not merely an "edge", but a *wide margin* of superiority in the Cylinder Conomotor . . . in weight . . . in compact size . . . in speed of operation . . . stem travel . . . and thrust. No other operator surpasses it for positioning accuracy and stability of operation. Diaphragm breakage is eliminated and maintenance is greatly reduced. It's easy to convince yourself. Just try one or several . . . and you'll standardize right down the line on Conomotor Series LB Control Valves.

(COMPLETE DETAILS IN CATALOG LB-1)

Curves Show Points of Superiority in the CONOFLOW PNEUMATIC CYLINDER OPERATOR





MODEL	B-10-TM Spring & Diaphragm Motor	B-12-T Springless Diaphragm Motor	B-53 Cylinder Conomotor
PISTON OR DIAPHRAGM AREA	←	50 square inches	→
THRUST	750 lbs.	1250 lbs.	4500 lbs.
STEM SPEED	12 seconds	10 seconds	4 seconds
TRAVEL	1"	1⅜"	4"
MAXIMUM SUPPLY PRESSURE	30 psi	30 psi	100 psi
WEIGHT	45 lbs.	45 lbs.	25 lbs.
SIZE	11¾" dia. 16¾" height	11½" dia. 14¾" height	9" dia. 14" height

Cono-Controls®

CONOFLOW CORPORATION

FOREMOST MANUFACTURERS OF FINAL CONTROL ELEMENTS

2100 ARCH STREET, PHILADELPHIA 3, PA.

EC&M Bulletin 1062 Type ZHS 2300-volt Motor Starter in Type VIII enclosure for Class I, Group D hazardous atmospheric locations.

Motor Starters

2200 TO 5000 VOLTS

HELP BOOST PETROLEUM PRODUCTION

● For maximum protection in hazardous locations, all connections, terminals and arcing parts of these Type ZHS Motor Starters are oil-immersed. In addition, oil-immersion keeps the mechanism thoroughly lubricated and protected against corrosion . . . eliminates the need for frequent inspection or maintenance.

These motor starters have self-contained, adjustable overload relays with inverse-time-element feature which protects motors from overheating as a result of overload, loss of one phase or failure to start. Of combination type, these relays assure instantaneous trip on heavy overloads or short circuits.

EC&M Type ZHS Starters for 2200 to 5000-volt motors are built in 50,000 KVA interrupting capacity and in the VALIMITOR (volt-ampere-limitor) style for use on power systems having infinite KVA.

Throughout the petroleum industry, EC&M Motor Starters are providing continuous safe service . . . helping to boost petroleum production.

Write for Booklet 1062 describing EC&M 2200-5000-volt motor starters

1924

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

BETZ • *A Great Name In Water Conditioning*

we're from Missouri...

. . . and for good reason!

Betz Water Conditioning Service is based on the policy that nothing is left to chance. There are no mere guesses or assumptions that conditions are satisfactory at a client's plant.

In addition to regular visits by Betz Engineers and daily water testing by plant personnel, we "double-check" results by means of more complete analyses in our own laboratories.

At regular intervals, water samples from important points throughout the plant system are secured by our engineers and forwarded to our modern laboratories. Here, experienced chemists analyze each sample until it literally breaks down and "admits the facts".

Such painstaking analyses often reveal conditions which may not be evident from plant control tests. It permits our Engineering Division to make corrective recommendations *well in advance*, thereby heading off any serious trouble which might develop. This, too, is *another* important part of Betz *completely-integrated* water conditioning service.

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa.

In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Sun Oil Company Puts New B&W "CO" BOILER On Stream at Toledo

SUNOCO

Waste heat at Sun Oil Company's Toledo, Ohio, refinery is being put to work to generate some 50,000 pounds of steam per hour. Add this to the 140,000 lb per hour generated from conventional fuels, and the total output of this B&W C O Carbon Monoxide Boiler is 190,000 lb per hour; steam to run compressors and other "cat cracker" auxiliaries efficiently.

When the catalytic cracking unit is on stream, the CO Boiler is fired with the exhaust gas from the catalyst regenerator in combination with fuel oil or refinery gas. The sensible heat and combustible carbon monoxide and any unburned hydrocarbons in the catalytic gases, exhausting from the regenerator of the cracking unit at a rate of 150,000 lb per hour, are used to produce 50,000 lb of steam per hr in the CO Boiler, instead of being expelled as waste gas. When the catalytic cracking unit is shut down, the CO Boiler, oil-fired, is available to operate as a conventional boiler, supplying steam whenever it's required.

Sun Oil has spent well over $1,000,000 in order to improve the surrounding atmosphere as much as possible by eliminating smoke and recovering valuable heat otherwise lost. This fuel saving is expected to amortize the investment in approximately four years.

This major stride in "putting waste heat to work" is the result of close cooperation between Sun Oil Company, Gilbert Associates, and The Babcock & Wilcox Company. Confidence in this project has resulted in the ordering, by Sun Oil Company, of two additional boilers from B&W for burning waste catalytic gases.

There are now three CO Boilers in operation—all Babcock & Wilcox. Let us discuss with you the working advantages of the CO Boilers and give you additional details. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

Sectional side elevation of CO Boiler.

General view of Houdriflow Catalytic Cracking Unit at Toledo. B&W CO Boiler is in foreground.

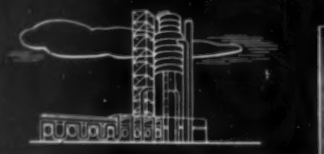
BABCOCK & WILCOX

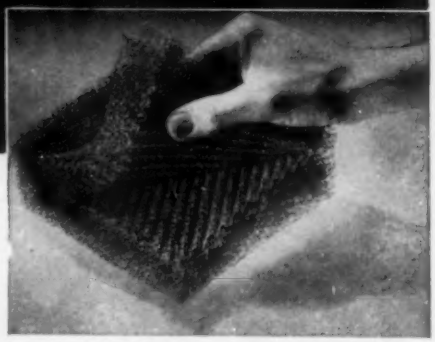
BOILER DIVISION

IS LIQUID CARRY OVER–

. . . Limiting Your Production?
. . . Affecting Product Purity?
. . . Cutting Into Your Profits?

IF SO–GET THE FACTS ON METEX MIST ELIMINATORS!





Section of a METEX MIST ELIMINATOR, opened to show construction. They can be made of practically any metal, to combat corrosion. Factory cut to fit vessel dimensions and contour, there is no limit to the size in which they can be obtained.

Liquid entrainment need no longer be considered an unavoidable nuisance in processing operations, as more and more engineers are finding from experience. These *knitted* wire mesh entrainment separators literally "filter out" the entrainment (see diagram) and permit the gas to pass on, freed from the unwanted—and often contaminating—liquid.

METEX MIST ELIMINATORS can be easily installed in new or existing vessels. They require no special housings, equipment or power—and need no servicing or attention. They function over a wide range of velocities with a pressure drop usually so low it cannot be measured. Users report efficiencies of 99% and more.

METEX Mist Eliminators can be used wherever the problem of liquid entrainment exists. By effecting complete removal of liquids, Mist Eliminators contribute to more efficient and economical processing in such vessels as:

- **VACUUM PIPE STILLS**
- **FRACTIONATING TOWERS**
- **KNOCK-OUT DRUMS**
- **EVAPORATORS**
- **ABSORBERS**
- **SCRUBBERS**
- **COMPRESSORS**
- **SEPARATORS**
- **STEAM DRUMS**

Write TODAY for free catalog giving complete information and engineering data. Or tell us about your SPECIFIC *entrainment problem.*

When a gas is generated in or passes through a liquid (1), it carries with it on leaving the surface (2), droplets of entrained liquid. These droplets are carried upward by the rising gas stream (3). As the gas continually changes direction in passing through the pad, the droplets are impinged on the extensive wire surface. Here the droplets coalesce, forming large drops of liquid which break away (4) from the pad and fall back through the gas stream. The gas (5) passes on, freed from liquid entrainment.

METAL TEXTILE CORPORATION

KNITTERS OF WIRE MESH FOR MORE THAN A QUARTER CENTURY

METEX

Roselle, New Jersey

CATALYST CONTAMINATION CURED BY REMOVING ENTRAINMENT IN DISTILLATION UNIT

Equipment Costing $15,000 Pays Out In Under A Week For Large Southwestern Refinery

It was not a difficult problem to trace the cause of mounting catalyst losses to a cat unit feed so poor in color that it was essentially black. Entrainment of liquid from the bottom of the still column could be the only answer.

Here was a situation where a Metex Mist Eliminator would remove the entrainment – but what else might happen? Would this knitted wire mesh separator cause excessive pressure drop? How quickly would it become plugged by coke deposits and make the column inoperable?

Calculations by one engineer showed that the total cost of installing a 25-ft diameter Mist Eliminator, including designing and erecting supports within the still, was approximately $15,000 – less than a week's catalyst loss. After considerable study the decision was made, and the Mist Eliminator installed during the next routine turnaround.

When the first run of cat unit feed came from the remodeled crude distillation unit, it was crystal clear and water white. Throughout the normal run no differential pressure across the screen was found.

The problem was solved. Catalyst losses dropped sharply. And the Mist Eliminator has paid for itself in a matter of days.

Have you really analyzed your entrainment costs, and checked the savings a Mist Eliminator could make for you? Perhaps you are losing valuable end products in the exhaust stream. Perhaps you have a nuisance contamination problem. Perhaps the entrainment created in one vessel is causing trouble in a subsequent operation. For entrainment is an inevitable result of most processing and refining operations.

Metex Mist Eliminators perform just one function—and they are doing it in more and more refining vessels every day. They remove liquid entrainment—efficiently and economically—wherever it may occur.

Why not write today for more information on Metex Mist Eliminators. Or better yet, send data on your particular entrainment problem. We'll be glad to have our engineers check this, and send you our recommendations and suggestions.

REFINERY PROCESS NEWS

PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY DECEMBER 1954

Two Canadian Plants Now Underway Feature Combination Refining

Underlining the current high interest in combination catalytic refining, Kellogg's roster of construction projects underway in Canada includes two new refineries, both of which will be fully integrated with all units controlled from a central point.

It is interesting to note that the first combination catalytic plant to be built on the North American continent was also Canadian—a 5000 BPD refinery completed by Kellogg in 1950 for the British-American Oil Company, Ltd. at Edmonton, Alberta. Since then, combination refining has seen a resurgence reminiscent of the 1930's when it was first introduced by Kellogg in connection with thermal refining.

Principle reason for this is that big savings in both investment and operating costs have been proved conclusively in this and other plants which are now several years old. High on the list of savings achieved in these plants are those related to a more compact design with elimination of costly intermediate storage and duplication of equipment, all of which combination processing makes possible.

20,000 BPD Refinery at Montreal

One of the new Canadian plants—a 20,000 BPD refinery located in the Montreal area—is nearing the half way point for Canadian Petrofina, Ltd., a newly formed company. As with its other Canadian projects, Kellogg's wholly owned subsidiary, Canadian Kellogg Company, Limited, is handling procurement and construction, while design and engineering are being carried out at Kellogg's New York headquarters.

The plant is designed with flexibility to handle both Middle East and Venezuelan crudes. Processing facilities for which Kellogg is responsible include topping, vacuum flashing, catalytic reforming, catalytic polymerization, alkylation, and distillate and gasoline treating. In addition, construction activities embrace all required off-site facilities such as a steam generating plant, a cooling water system, wharfage for tankers, crude oil and product storage, and truck, rail and barge loading installations.

12,000 BPD Plant Near Winnipeg

Near the city of Winnipeg, the other new refinery is taking shape for the North Star Oil Company, Ltd. Designed for a rated capacity of 12,000 BPD of Western Canadian crude, the

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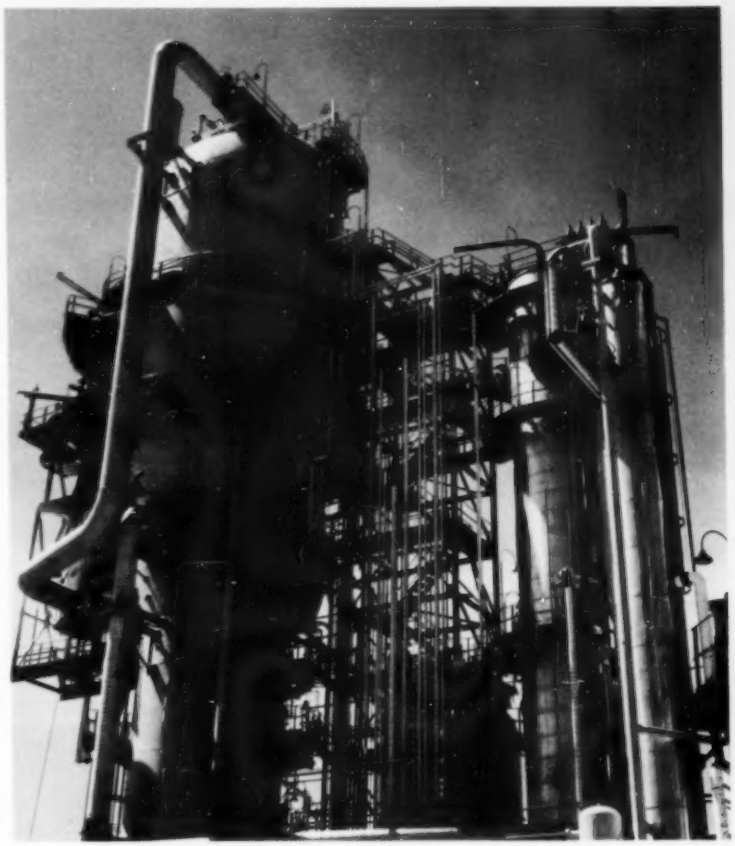

Design Innovations Mark Canada's First Model "B" Orthoflow

Completed in a record time of less than a year from start of construction, a major refinery expansion, which includes the first Model "B" Orthoflow Fluid catalytic cracker to be built in Canada, has now been in successful operation for several months. The refinery is that of the British American Oil Company at Clarkson, Ontario. In addition to the Orthoflow—Kellogg's exclusive regenerator-above-reactor single vessel design—the expansion program here included an integrated vapor recovery system and catalytic polymerization with feed desulfurization facilities.

The fourth Model "B" Orthoflow to be placed in operation so far, the Canadian unit departs from its three predecessors in several interesting respects. One of the departures from customary cat cracking practice is the use of electric motor drives on both the centrifugal air blower and the gas compressor. This development, which was prompted by a shortage of steam at the refinery, represents considerable savings in need for boiler house expansion in an area where electric power is relatively cheap.

Another novel feature of the Canadian unit as compared with most previous cat crackers is the absence of refrigeration facilities in the gas recovery system. Availability of unusually cold (lake) cooling water at the plant site made this change possible. An allied feature is a somewhat simplified absorber-stripper design without inter-cooler circuits and gas lift. The plant is the first Model "B" designed to operate with either natural or synthetic catalyst.

The design capacity of the Canadian plant is approximately 12,000 BPD. In its approximately six months of operation, the unit has offered an outstanding example of the flexibility

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REFINERY PROCESS NEWS

CONTINUED FROM PRECEDING PAGE

(continued from previous page)

Two Canadian Plants...

plant will see Canada's second Orthoflow cat cracker of the Model "B" type, and in addition will comprise atmospheric and vacuum distillation, gas recovery, catalytic polymerization, LPG production facilities and treating equipment. Kellogg designed all process and off-site facilities. Gasoline production of the refinery will be in the neighborhood of a quarter of a million gallons per day. Other products will include kerosene, diesel oil, heating oil, furnace oil and LPG.

Both refineries are scheduled for completion during the coming year.

Thermal Cracker for Canadian Refiner

Progress on a thermal cracker Kellogg is now building for a refiner in Edmonton indicates that it will be completed this spring after an elapsed time of only 10 months from award.

Kellogg is fulfilling its contract on this job through its subsidiary, Canadian Kellogg Company Limited, which is responsible for all construction and purchasing. The cracker is a 3000 BPD unit which will utilize light cycle oil from an existing cat cracker, and other refinery fractions. Its purpose will be to take additional gasoline from partially refined material which would otherwise go into production of less profitable fuel oil.

(continued from previous page)

Design Innovations...

inherent in the Orthoflow design. Recently the plant was put through its paces at the design rate and the performance of the Orthoflow again proved more than satisfactory.

For further information, technical data, etc., on any refining process, write
REFINERY PROCESS DIVISION
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In Canada
The Canadian Kellogg Company, Limited
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KELLOGG PULLMAN

Top photo shows many of the off-site facilities, under construction in September by Canadian Kellogg, at the new Canadian Petrofina Montreal-area refinery. Lower illustration shows progress in North Star process facility area at about the same time. The pedestal which will support the Model "B" cracking unit appears at the center.

Western Canada's First Lube Plant Scheduled for Completion in 1955

A $14 million lubricating oil plant—the first in Western Canada and the second largest to be built in that country—is now well underway near Edmonton, Alberta. Canadian Kellogg Company, Limited, is constructing essentially all of the new plant for Imperial Oil Limited. Now more than a third finished, the plant *is scheduled for completion in 1955.*

Production capacity of the lube oil manufacturing facilities will be some 2,000 barrels of automotive and industrial oils daily. The four main process units under construction by Kellogg are a phenol treating plant, a dewaxing plant, a hydrofinishing plant and a catalytic reformer which will furnish hydrogen for hydrofinishing.

In addition Kellogg is building certain off-site facilities, among which is what is described as the most modern compounding, blending and packaging plant for lube products so far designed; a warehouse; and railroad loading and unloading facilities.

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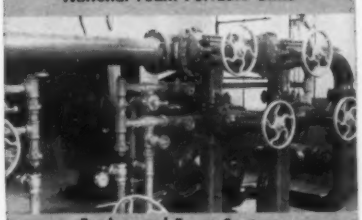

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TECHNICAL DATA

TEST			FISHER TYPE 3500
INSTRUMENT PRESSURE SENSITIVITY - CONTROLLING PRESSURE CHANGE NEEDED TO PRODUCE 2 LBS. TO 15 LBS. TO DIAPHRAGM			0.07 LB
STEM MOVEMENT SENSITIVITY AMOUNT STEM CHANGE TO PRODUCE 2 LBS. TO 15 LBS. TO DIAPHRAGM	½" TRAVEL		0.0037" AVE.
	2" TRAVEL		0.015" AVE.
SPEED TIME IN SECONDS FOR FULL TRAVEL	SIZE	TRAVEL	
	DD	¾"	1.2 — 1.2 SEC.
	FF	1½"	4.2 TO 4.8 SEC.
	GG	2"	7.2 SPC TO 9.6 SEC.
	HH	2"	10.5 TO 12.6 SEC.
LAG ERROR IN POSITION AT 9 LBS. CONTROLLER PRESSURE	½" TRAVEL		0.0006" AVE.
	2" TRAVEL		0.001" AVE.
EFFECT OF VARIATIONS IN AIR SUPPLY PRESSURE	½" TRAVEL		0.1 LB. PER 5 LB. CHANGE
	2" TRAVEL		0.1 LB. PER 5 LB. CHANGE
CHARACTERISTICS CONTROLLED P VS DIAPHRAGM P			LINEAR
COMMENTS			STABLE ADJUSTMENTS ALL EASY AND SIMPLE
AIR CONSUMPTION NORMAL 9 LBS. DIAPHRAGM PRESSURE			15.0 CU FT/HR

FOR COMPLETE DETAILS WRITE FOR BULLETIN E-3500.

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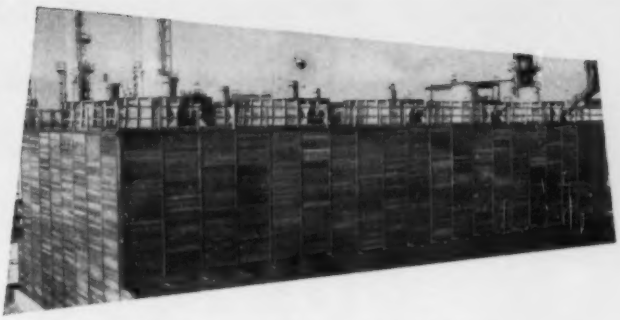
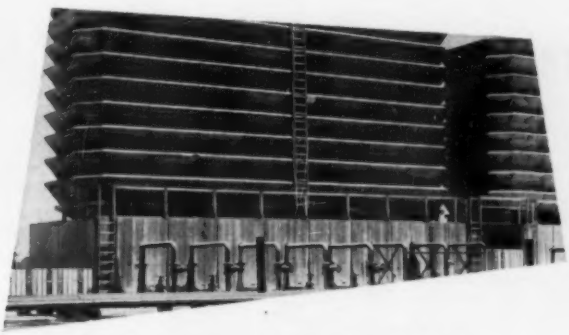


18,760 gpm of refinery process water are cooled from 120° F. to 85° F. in this Pritchard induced draft cooling tower at the Pure Oil Company refinery, Toledo, Ohio.

The 16 cells of this induced draft Pritchard tower, built for the Ohio Oil Co., Robinson, Ill., are divided into 9 sections, each designed for a different cooling performance. Total design capacity is 48,000 gpm.



This Pritchard atmospheric cooling tower is cooling process water from an initial temperature of 105° F. to a final temperature of 90° F. for the Sunray Oil Company at Placedo, Texas.

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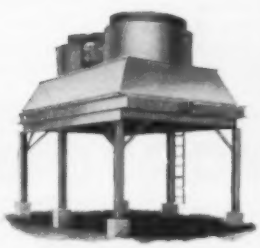

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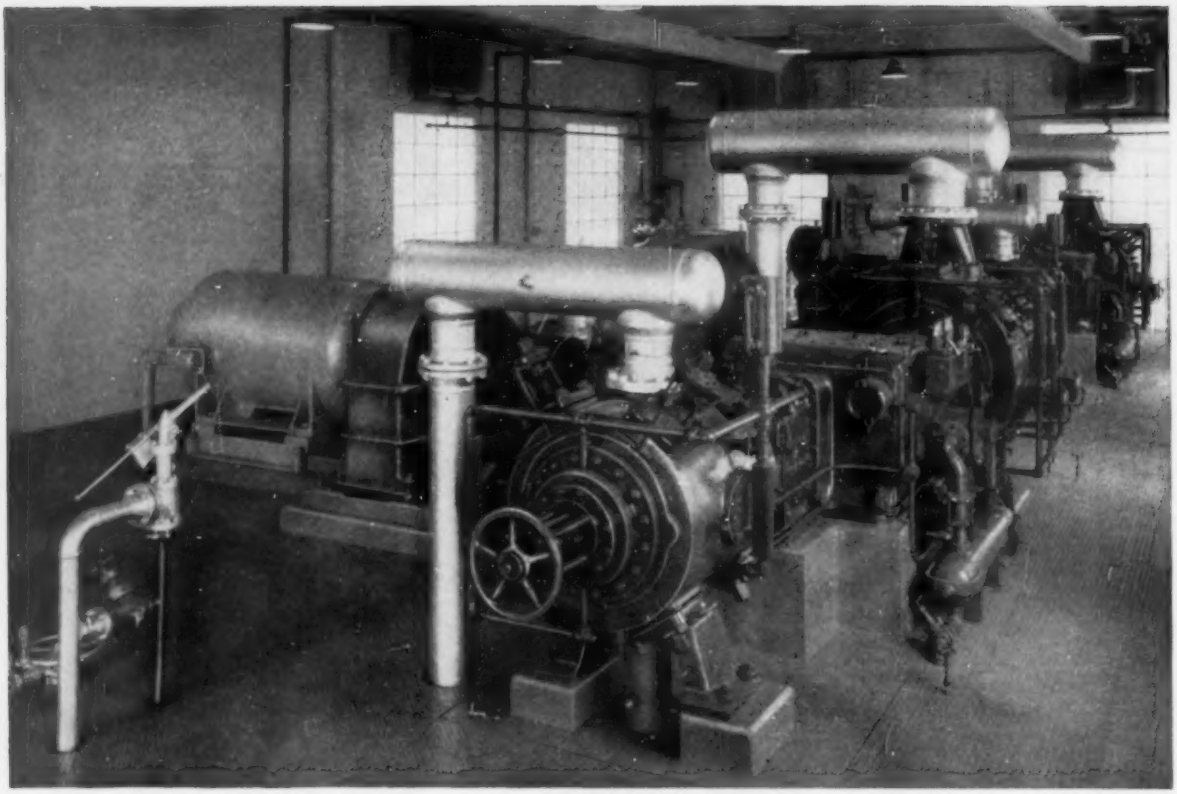
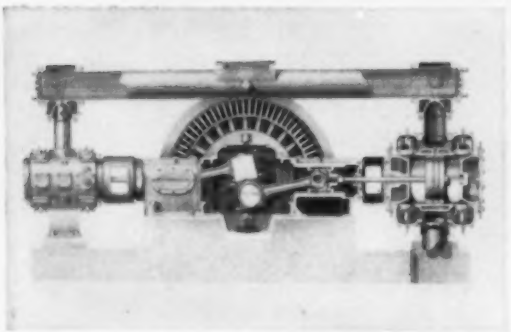


LINEUP OF WORTHINGTON 2-cylinder gas compressors at Frontier Oil's new Tonawanda (N.Y.) refinery. Units are rated at 600 hp each.

Frontier's new refinery gets Worthington compressors



CUTAWAY VIEW of Worthington balanced-opposed compressor. Note low silhouette, modest foundation requirements, and double-throw crankshaft which permits as many as four pairs of cylinders to be arranged on single compressor frame.

At Frontier Oil Refining Company's big new refinery in Tonawanda, N.Y., two Worthington type BDC-2 balanced-opposed gas compressors have gone to work in the two stage compression of hydro-carbon gas mixtures. By selecting Worthington units, Frontier made sure of:

Smooth, vibrationless operation. Two throw crankshaft with cranks set at 180 degrees gives opposed piston action.

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In chemical plants and general industrial installations, these Worthington units are paying off in dependable operation. You can use practically any type of drive to power them. Like all Worthington compressors, they are equipped with the exclusive Feather* Valve — lightest, tightest, most efficient valve made.

Remember, no matter what your capacity or pressure requirements may be, there's a compact Worthington steam- or motor-driven compressor to fill the bill. Write Worthington Corporation, Compressor Division, Section K.3.5, Buffalo, N.Y. K.3.5

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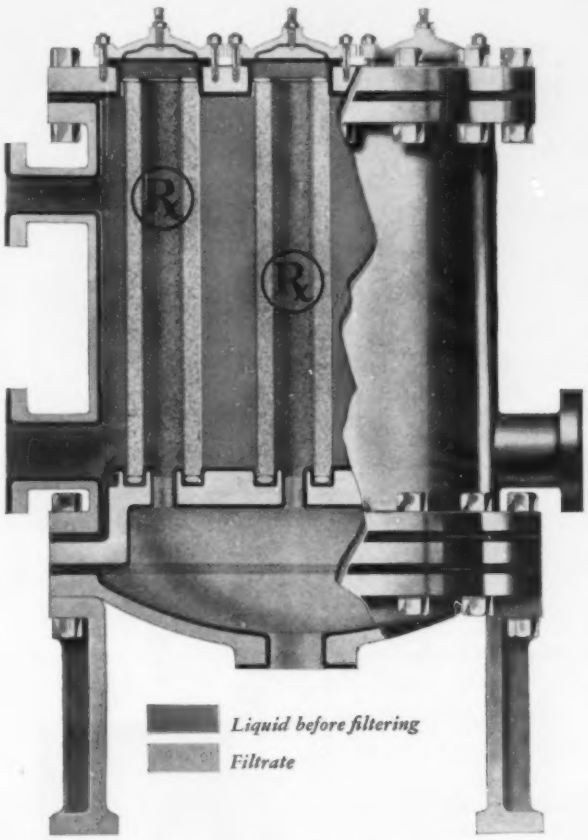

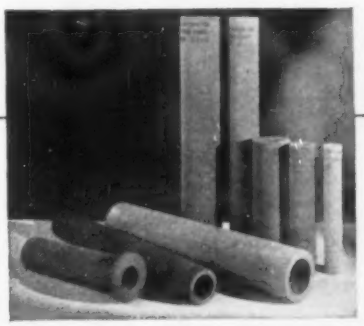

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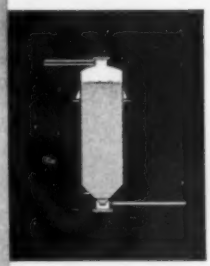

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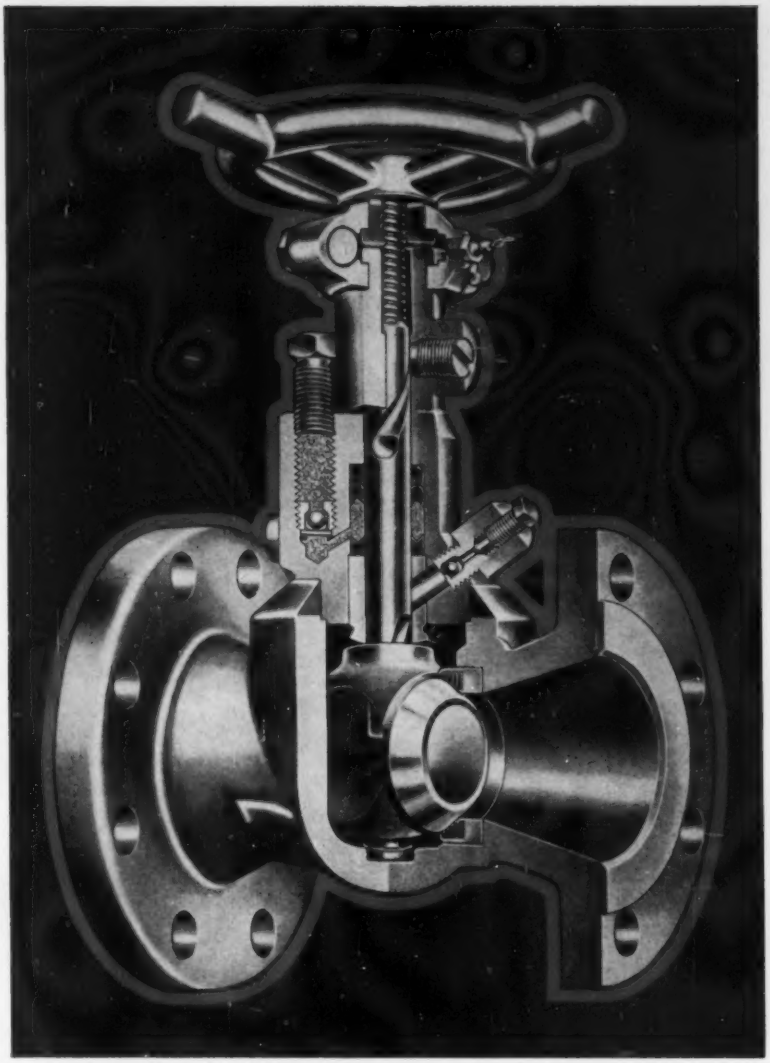

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400 Lb.	4", 6"	2500 Lb.	2½", 3", 4"
600 Lb.	2", 2½", 3", 4", 6"		

AVAILABLE SIZE RANGE — FULL ROUND OPENING TYPE
FLANGED AND SCREW END

ASA CLASS	SIZES	ASA CLASS	SIZES
300 Lb.	2", 2½", 3", 4"	900 Lb.	1", 1½", 2", 2½", 3", 4"
400 Lb.	4"	1500 Lb.	1", 2", 2½", 3"
600 Lb.	1", 1½", 2", 2½", 3", 4"	2500 Lb.	1", 2", 2½", 3"

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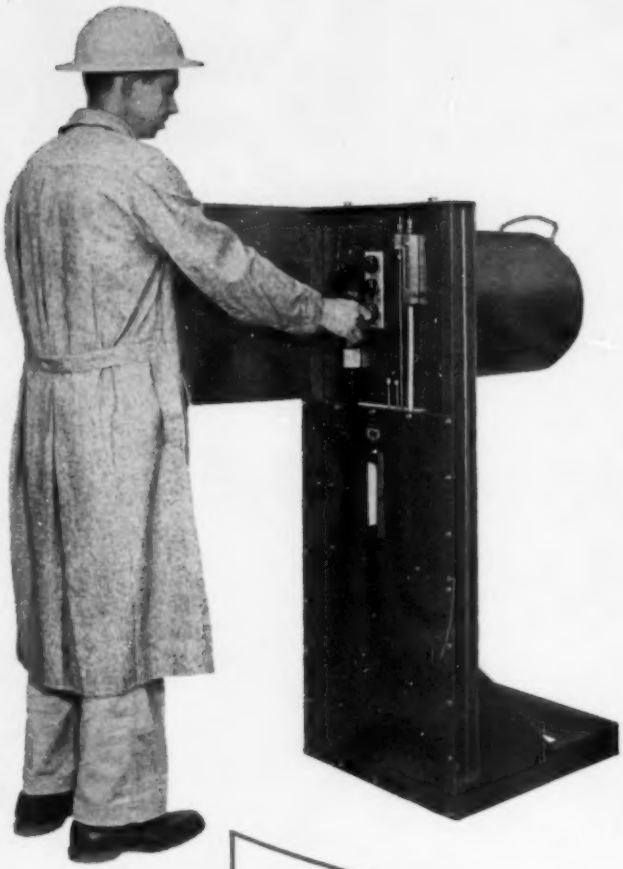

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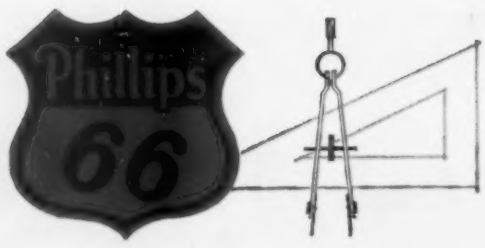

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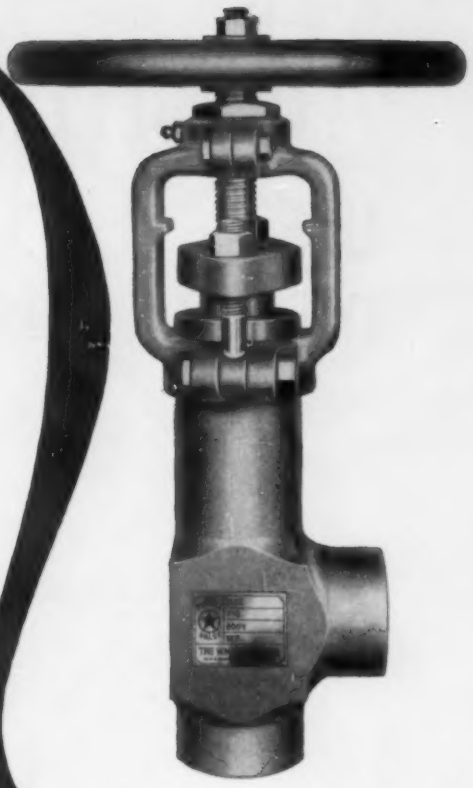

High pressure angle valve

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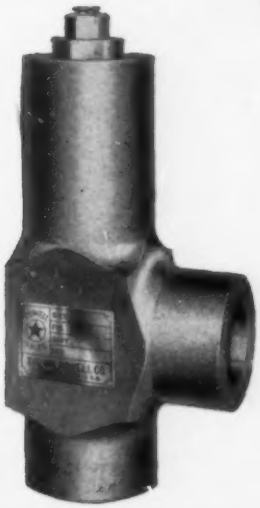
High pressure angle check valve



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USE BS&B CLIMAX
TYPE 86-TW DIAPHRAGM OPERATORS

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This versatile Climax Type 86-TW Diaphragm Operator is a modified version of the controlling mechanism of the famous BS&B Climax Type 86 Control Valve. It has been adapted for use with a variety of other valves, instruments and controls such as butterfly valves, diaphragm valves (Saunders Patent), engine throttles and other controls where controlling pressure is available for translation to reciprocating motion.

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For more complete information on the Climax Type 86-TW Diaphragm Operator or on other Climax Controls, ask your BS&B Man or Sales Representative, or write to . . . .

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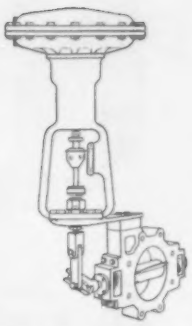
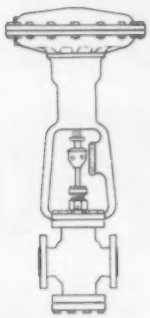


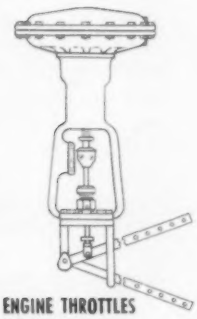
FOR BUTTERFLY VALVES

Climax Type 86-TW Diaphragm Operator is ideal for automatic control of butterfly valves. Mounts easily on any make of valve, and can be set for any specified operation of the valve.



FOR DIAPHRAGM VALVES

First developed for use on diaphragm valves, Climax Type 86-TW Diaphragm Operator has large diaphragm area and variable spring loading to insure minimum hysteresis.



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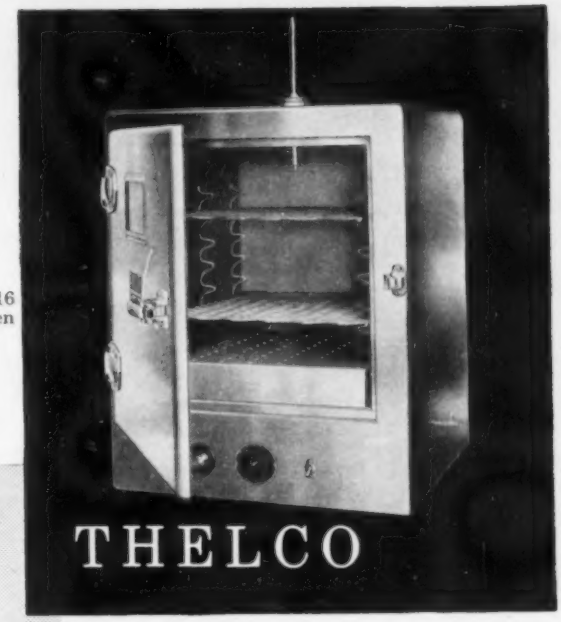
Wherever a sensitive yet positive reciprocal controlling motion is needed, such as on engine throttles, speed governors, cooling tower weirs, valve levers, etc., the versatility and adaptability of the Climax Type 86-TW Diaphragm Operator make it the ideal selection.

Not in a class by themselves

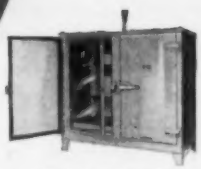
but first in their class!

Model 18 Oven



Model 16 Oven

Model 19 Vacuum



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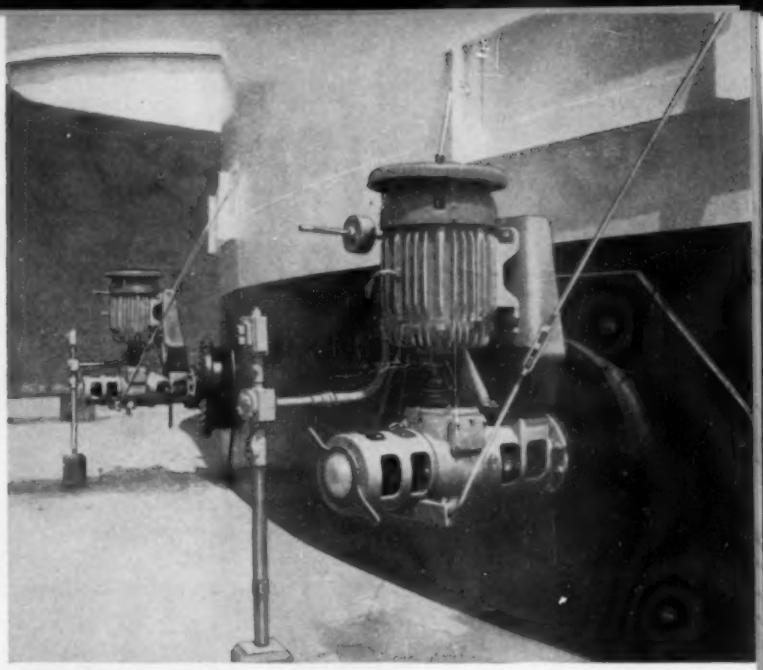
of mixing and blending in big tanks



YOU CAN REPACK the stuffing box or replace the rotary mechanical shaft seal on a LIGHTNIN Side Entering Mixer, under a full head of 5 million gallons—without losing a pint of product.

Now you can *choose* the kind of mixer shaft sealing that best meets your operating requirements—gives you the most in trouble-free operating hours . . . in maintenance dollars saved.

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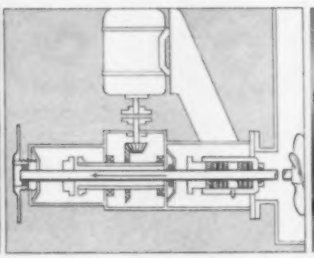
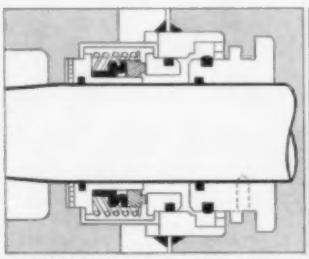
For quick, competent help—and fully guaranteed results—on *any* fluid mixing job, big or small—call in your LIGHTNIN representative. Or write us today.

STUFFING BOX repacking is fast, simple. Turning this easy-to-get-at bearing member...

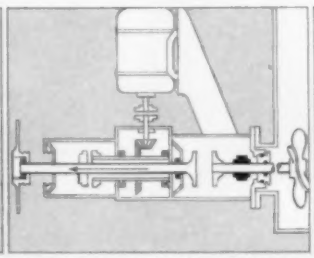


...retracts the mixer shaft outward, like the stem of a valve. Inside the tank...

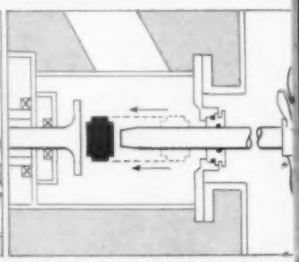
...a Teflon "O" Ring squeezes against the shaft and flange hub, keeping product safely in the tank while you change packing



ROTARY SEAL ends repacking—forever. Seal runs without adjustment for its lifetime. Easy to replace, too...



...Shaft comes apart. Tank end of shaft locks in place and seals liquid safely in the tank...



...Shaft coupling is removed. Seal comes off *as a unit*. New seal goes on *as a unit*. In a few minutes, you're back in operation.

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PETROLEUM PROCESSING
DECEMBER 1954

Petroleum Processing's Panel of Experts Forecasts—

What 1955 Will Bring Refiners

- **Domestic Product Demand—UP 5.0%**
- **Export Trade—DOWN 19%**
- **Octane Numbers—UP to 95-96**
- **Surplus Capacity—UP to 1,375,000 bbl.**

By V. B. GUTHRIE
Associate Editor

TOTAL domestic demand for the big volume petroleum products next year is expected to be up 5.0% over current requirements. That's the consensus of the oil company economists among a group of 50 authorities polled by PETROLEUM PROCESSING in its annual survey to find out what's ahead for the industry. This forecast is based on normal winter temperatures in 1955.

The anticipated upsurge is particularly heartening in view of the fact that demand this year has been only about 1% above 1953—a considerable slackening off in the rate of increase which the industry has been experiencing.

On other points, the economists predict:

- Exports of petroleum products will continue to fall off. Next year they are expected to be down nearly 19% compared to 1954, which in turn is something like 9% below 1953.
- Premium motor fuels are expected to reach research octanes in the range of 95-96, with the aromatic content of the average gasoline going up 7-8%—both the result of rapid expansion of catalytic reforming facilities.
- Surplus refining capacity will increase to 1,375,000 bbls., some 120,000 bbls. more than the present 1954 surplus.

To get a better perspective on the 1955 outlook, let's look briefly at the 1954 picture.

U.S. refiners started their 1954 operations with their sights on an estimated gain of 3.5% in domestic demand, and they prepared for a considerable loss in exports, making their total overall anticipated product demand 2.5% over 1953 actual shipments. They adjusted crude runs to this basis.

By the middle of the year, however, it became apparent that requirements were not living up to the earlier estimates. Inventories, of gasoline in particular, were becoming topheavy. Crude runs were cut back, and since late summer have been below the level for the same period in 1953.

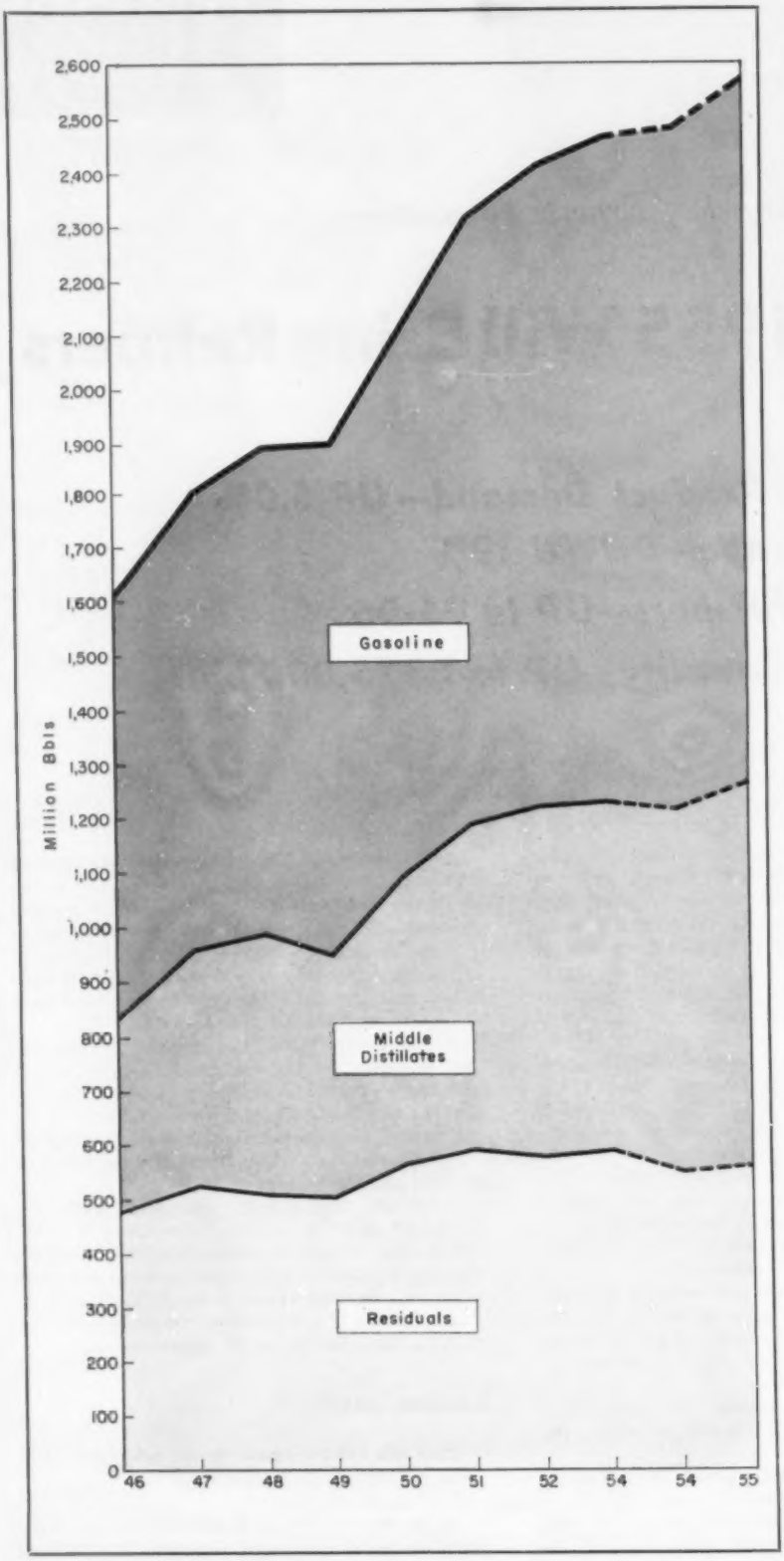
There appear to be three primary reasons for the slowdown: 1—The mild 1953-54 winter, which put a brake on the consumption of oil for heating. 2—The general decline in industrial activity in the nation. 3—The accelerated decline in exports as newly-installed refining capacity in Western Europe came on stream.

What are the present readjusted levels for product demand and refiners' inventories in 1954? What is the forecast for demand in 1955? What's the export picture? Information on these and other points is presented below in the form of consolidated answers to a series of questions PETROLEUM PROCESSING asked of the 50 authorities.

Demand — 1954

How will 1954 demand for the principal petroleum products actually shape up?

By the end of 1954, it is now evident, the combined domestic and export demand for gasoline, middle distillates, residual fuels, jet fuels (now reported as a separate product) and lubricating oils will be only about 1% larger than in 1953.



PETROLEUM PRODUCTS DEMAND, for period 1946 to 1955 (estimates for '54 and '55); residuals, middle distillates, and gasoline

Some authorities consider even this gain good performance for the refining industry under the circumstances and some progress has been made by refiners toward bringing their stocks, gasoline particularly, more into line with supply-demand needs.

The 1954 overall increase in gasoline demand will be about 1.5% and in the middle distillates (kerosine and distillate fuels) 4.6%. Heavy fuel oil shipments will end 1954 about 6% lower than in 1953, reflecting the stronger competition of natural gas in the energy field, as well as other economic factors. Jet fuel demand will gain about 37.5% and lubricating oil requirements around 4%.

Taking into account the drop in exports in 1954 of about 9%, domestic demand for that year will level off at about 1,229,000,000 bbls. for gasoline, 1.9% larger than 1953; for the middle distillates 643,860,000 bbls., a 6.7% gain and this volume may be larger if real winter starts in December and increases heating oil consumption. Domestic heavy fuel requirements for the current year are placed at 527,425,000 bbls., a drop of almost 7% from 1953.

Demand – 1955

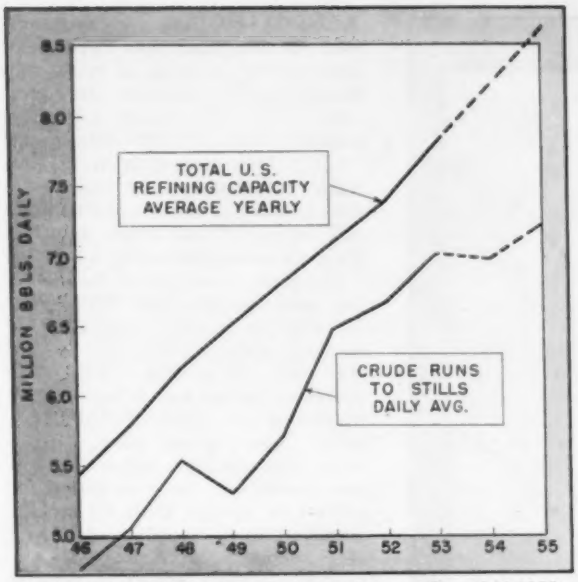
How much of an increase in demand in 1955 can U.S. refiners expect?

Overall demand—domestic and export—for gasoline, middle distillates, residual fuels, jet fuels and lube oils is forecast at 2,700,660,000 bbls. This will be an increase of 4.1% over the present estimated 1954 requirements and the largest rate of gain since 1951.

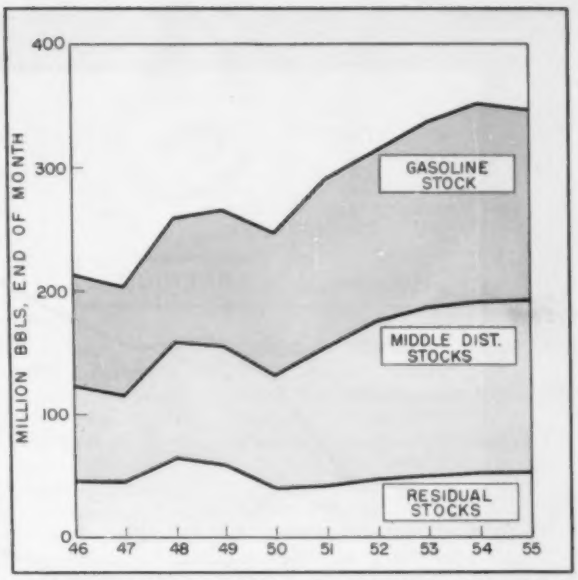
This forecast is based on normal temperatures for the heating season (so far they have been about normal) and moderate gains in industrial activity. It allows for an even larger drop in petroleum exports, for our shipments abroad do not yet show signs of leveling off.

Overall 1955 demand for gasoline is estimated at 1,307,795,000 bbls., 3.5% larger than in 1954; middle distillates at 708,830,000 bbls., 5.4% larger; residual fuels at 564,655,000 bbls., 1.7% larger; and lubricating oils at 54,385,000, a small decrease.

Exports of the volume products in 1955 will be about 19% less than for the current year, it is forecast, reflecting the loss of markets to the expanding refining capacity in Western Europe. Shipments of lubricating oils will drop from 15,695,000 bbls. in 1954 to 13,500,000 bbls. in 1955, a decline of about 14%. Our export trade in these products next year will be only about 3% of the total demand at U.S. re-



REFINING CAPACITY AND CRUDE RUNS to stills, 1946-1955, millions of b/d, yearly averages



PRODUCT STOCKS at refineries, Dec. 31, 1946-1955; residuals, distillates, and gasoline

fineries. In 1951 it was nearly 5%.

Total domestic demand for the volume products, including lube oils and jet fuels, in 1955 will be about 2,614,000,000 bbls., an increase of 5% from 1954. Domestic gasoline requirements will be 1,279,690,000 bbls., 4.1% more than is estimated for 1954. Middle distillates demand is forecast at 685,835,000 bbls., 6.5% larger. Anticipated domestic demand for residual fuel oil is 542,755,000 bbls., 2.9% larger than the estimated 1954 figure, which in turn showed a decline from 1953 for this product. Domestic lubricating oil requirements are forecast at around 41,000,000 bbls., which is a gain of 1.8% from estimated 1954 domestic demand. Of the 1955 requirements, some 23,500,000 bbls. will be automotive and aviation lubricants and 17,500,000 bbls. industrial and processing oils.

Military Needs

Will there be any significant change in our military requirements this coming year?

A big jump in jet fuel demand is the principal change forecast in the petroleum requirements of the military forces for 1955. U.S. military world wide requirements for jet fuels on a peacetime basis are estimated at 65,000,000 bbls. for the year 1955, an increase of nearly 36% from the 1954 volume. The present use of jet fuel is about twice what it was in 1953. By another year it will exceed the consumption in this country of fuel by Diesel locomotives. The makeup of jet fuel is now running about 71% gasoline, 21% kerosine and the remainder distillate. The proportion of kerosine will increase next year. Military requirements for other petroleum products in 1955 will be only slightly above current level, it is estimated.

Refinery Stocks

Can refiners expect inventories of products to be brought into better balance in 1955?

Product inventories at refineries are being adjusted currently to the anticipated supply-demand needs, with runs to stills at a reduced rate from earlier in the year.

U.S. gasoline stocks the latter part of October, at 150,000,000 bbls., were about 9,000,000 bbls. larger than Oct. 30, 1953. The last of March they were 17,000,000 bbls. greater than on the corresponding date in 1953 and those inventories were considered too high.

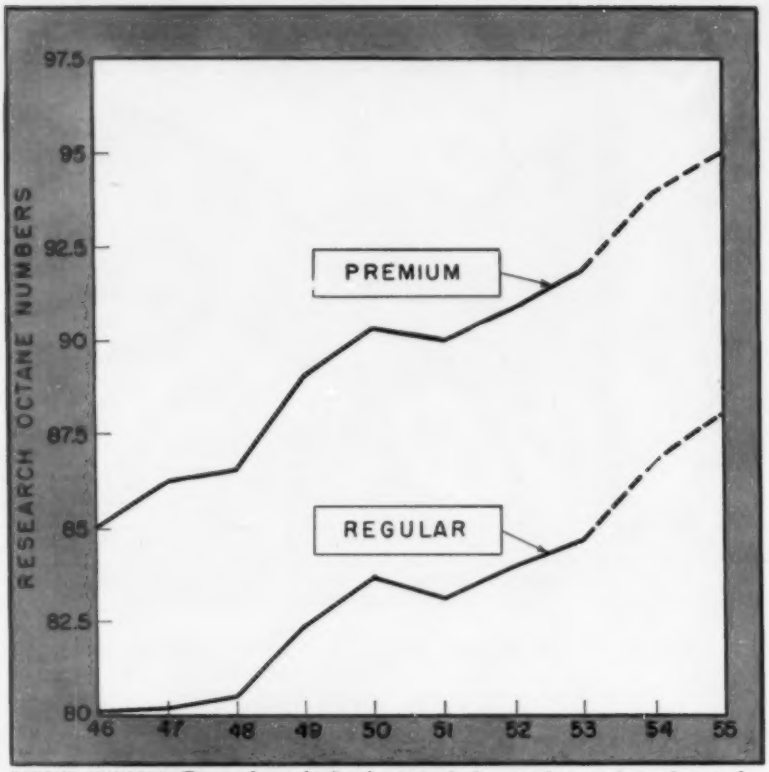
Middle distillates, in the spring, at

PETROLEUM PRODUCT DEMAND 1953-1955

(in 1000 bbl.)

	1953	1954*	% Change	1955*	% Change
DOMESTIC					
Gasoline	1,206,329	1,228,955	+ 1.9	1,279,690	+ 4.1
Kerosine	114,520	118,260	+ 3.3	121,180	+ 2.5
Distillates	489,110	525,600	+ 7.5	564,655	+ 7.4
Total Middle Distillates	603,630	643,860	+ 6.7	685,835	+ 6.5
Residual Oils	564,933	527,425	— 6.6	542,755	+ 2.9
Lubes	40,481	40,150	— 0.8	40,880	+ 1.8
EXPORTS					
Gasoline	37,920	34,310	— 9.5	28,105	—18.1
Kerosine	7,212	5,475	—24.1	4,380	—20.0
Distillates	32,269	22,995	—28.7	18,615	—19.0
Total Middle Distillates	39,481	28,470	—27.9	22,995	—19.2
Residual Oils	26,208	27,740	+ 5.8	21,900	—21.1
Lubes	13,015	15,695	+20.6	13,505	—14.0
OVERALL					
Gasoline	1,244,249	1,263,265	+ 1.5	1,307,795	+ 3.5
Kerosine	121,732	123,735	+ 1.6	125,560	+ 1.5
Distillates	521,379	548,595	+ 5.2	583,270	+ 6.3
Total Middle Distillates	643,111	672,330	+ 4.6	708,830	+ 5.4
Residual Oils	591,141	555,165	— 6.1	564,655	+ 1.7
Lubes	53,496	55,845	+ 4.4	54,385	— 2.6
Jet Fuels	34,892	48,000	+37.5	65,000	+35.4
Totals	**2,566,889**	**2,594,605**	**+ 1.1**	**2,700,665**	**+ 4.1**

*1954—8 months actual, 4 months forecast; 1955—forecast.



OCTANE NUMBERS (Research method) of motor fuels, premium and regular grades, Dec. 31, 1946-1955

the end of the 1954 heating season, were about the same as in 1953. Over the summer, even with reduced crude runs, they have built up to a figure the last of October about 3,300,000 bbls. greater than a year ago.

Whether this readjustment in refinery product inventories continues and brings them to a better balanced position in 1955 depends mainly on how refiners meet this winter's demand for heating oils. If the need arises for increased output of distillate fuels and this need is met by increasing runs of crude oil to stills, gasoline inventories next spring could easily exceed the volume of 180,000,000 bbls. in storage March 31, 1954, which threatened gasoline market stability through the past summer.

Excessive build-up could be avoided in gasoline stocks over this winter, if the need for a larger refinery output of distillates is met by increasing distillate yields and reducing those for gasoline.

The Independent Petroleum Assn. of America, in its forecast of 1955 refinery operations, estimates primary gasoline inventories by Dec. 31, 1954, at 160,000,000 bbls. Actual inventories at the end of 1953 were about 149,000,000 bbls. By March 31 next, stocks of 180,000,000 bbls. are anticipated and the needs of the coming motoring season will bring gasoline inventories down to 145,000,000 bbls. by Sept. 30, 1955. Stocks the end of last March were also 180,000,000 bbls. but the reduction this summer brought them to only 152,000,000 bbls. on Sept. 30.

On the anticipated scale of refinery operations, the IPAA estimates middle distillate stocks (kerosine and distillate fuels) will drop from the 174,400,000 bbls. in storage late in October to 139,000,000 bbls. Dec. 31. This would be close to the actual level at the end of 1953. By next March 31 it is estimated that middle distillate stocks will be down to 78,000,000 bbls., which again is close to the actual level of that date this year.

Surplus Capacity

What changes is 1955 likely to bring in the volume of refinery processing facilities?

More surplus refining capacity will confront U.S. refiners in 1955 than since the national defense program started in 1951.

Average crude charging capacity of 8,625,000 bbls. daily for the coming year is estimated by PETROLEUM PROCESSING. Forecast of crude runs for 1955 is 7,248,000 bbls. daily average. This will leave a surplus capacity of 1,375,000 bbls., some 120,000 bbls. more than in 1954. A small portion of total capacity is old, high cost fringe equipment that likely will not be put into service except in the event of national emergency.

However, it is estimated there is today (and installed since World War II) catalytic cracking capacity to produce some 750,000 to 800,000 bbls. daily of gasoline. This is in addition to earlier installations capable of turning out about 1,500,000 bbls. daily. The postwar units, particularly, represent high investment costs and provide a strong incentive for refiners to operate them for a high gasoline output, regardless of general supply-demand conditions.

More catalytic reforming capacity also will be available to refiners in 1955 to convert naphthas and low antiknock gasolines into the high octane motor fuels which will be marketed next year. This charge capacity by the end of 1954 will be over 300,000 bbls. daily, and some 325,000 bbls. is building and will be in operation by the end of 1955.

One authority estimates that 500,000 bbls. of new reforming capacity will be installed in U.S. refineries during the last quarter of 1954 and in 1955. A small proportion of the catalytic reforming capacity is operated to produce aromatic compounds as bases for petrochemical manufacture, rather than to turn out motor fuels.

Lubricating oil manufacturing capacity in the U.S. in 1955 will be around 185,000 bbls. daily average, the PETROLEUM PROCESSING survey disclosed. If anything, this will be a reduction of a few thousand barrels from a year or so ago. Domestic and export requirements for 1955 are forecast at around 150,000 bbls. daily average.

Export Trade

Are there any signs of the decline in volume in our export trade leveling off?

The 1955 petroleum export market will be confronted by a new factor, the possible reopening of the Abadan refinery of the Anglo-Iranian Oil Co. in Iran, and its effect in further cutting into the U.S. trade in Western Europe. It is unofficially reported the plant will start up at a 135,000 bbl. daily charging rate, far under its total

capacity. Such a move would terminate gas oil contracts held by oil companies here to supply markets the Abadan refinery served prior to its nationalization in 1951.

About 200,000 bbls. daily of surplus charging capacity will exist in 1955 in refineries in England and continental Europe, which will have a total estimated capacity of 2,150,000 bbls. next year. Product markets served by these plants are growing at the rate of about 7% yearly, it is estimated, but plant expansion is continuing and some surplus capacity will remain there, providing a limiting factor for U.S. shipments. Lubricating oil manufacturing capacity in Western Europe is estimated at about 30,000 bbls. and is said to be increasing in line with the growth of markets to be served from this refining area.

These conditions have already put an imprint on U.S. export trade in petroleum products. Shipments of gasoline, middle distillates and residual fuels from U.S. refineries have dropped from 95,200,000 bbls. in 1947 to 90,520,000 bbls. in 1954 and an even sharper decline for 1955 is forecast—to 73,000,000 bbls. Lubricating oil exports dropped from 17,400,000 bbls. in 1951 to around 15,700,000 bb's. in 1954 and the 1955 total is forecast at 13,500,000 bbls.

Octane Numbers

What improvements in motor fuel quality can be expected in 1955?

Improvement in motor gasoline quality in 1955 will come chiefly in significant advances in Research octane numbers for both premium and regular grade fuels. The increases will come about largely through the availability of larger volumes of catalytic reformate from the reforming units now being installed in refineries. Some oil companies will be marketing gasolines next year that are essentially all reformate. One authority says the aromaticity of the average gasoline will be increased 7-8% next year.

Research octane numbers for premium will reach 95 average for the U.S. by the end of 1955, it is forecast and 96 in the east for some gasolines. The 95 average will be a gain of one octane from that at the end of 1954 and of almost 3 octanes from 1953. Regular grade U.S. average will be between 87.5 and 88 Research by the end of 1955.

The increases in motor fuel octane ratings now taking place are due more to sales and advertising competition among the oil companies than to an actual need for them in current model cars. PETROLEUM PROCESSING's editorial representative in Detroit reports the automobile makers believe the '55 models will operate satisfactorily on the fuels currently available. Average compression ratios of the new models will be around 7.93-1, he believes. The average for the 1954 models was 7.65-1.

"Several times the view has been expressed," he comments "that 1955 will be one year in which the automobile people are striving to develop engines that will utilize all the octane values the oil companies are making available. In years past the reverse has been true, with the oil companies trying to bring fuel octanes up to engine requirements."

Motor fuel vapor pressures may go a little higher in some companies' gasolines, following research findings that volatility can be increased without adding to the chances for vapor lock occurring. This would provide for practical utilization by refiners of a very small portion of the surplus butane available today.

Middle Distillates

Any new factors, aside from winter weather, to bear on the middle distillate markets in 1955?

Biggest factor in the demand for middle distillates in 1955 will be the degree of coldness of the winter we are just entering. Just how big can be seen from one oil company's estimate that actual consumption of heating oil (kerosine and distillate fuel) is reduced about 90,000 bbls. for each degree day of temperature above normal during the heating season. The 1953-54 season over the U.S. was 8% warmer than normal, the previous season 9% above normal. The 1955 forecast of middle distillate demand is based on the U.S. Weather Bureau normal winter temperature.

During 1955 there will be more than 7,500,000 central home oil heating systems using distillate fuels to be served, 7% more than in 1954.

One factor in middle distillate demand in 1955 outside home heating will be the smaller rate of growth in the consumption of oil by Diesel locomotive units. This is because the railroads have about completed their programs to replace steam locomotives with Diesels. This use of distillate, now slowing down, has nearly tripled since 1948.

All told, 1955 looks like a good year for refiners, with gains in product demand more in line with that of years prior to 1954, particularly if the current trend in readjustment of product stocks is continued.

REFINER'S PRODUCT INVENTORIES, DEC. 31, 1953-55

(in 1000 bbl.)

	1953	1954*	% Change	1955*	% Change
Gasoline	149,052	160,600	+ 7.7	155,000	— 3.5
Kerosine	28,684	28,900	+ 0.8	28,000	— 3.1
Distillates	111,741	110,300	— 1.0	112,000	+ 1.5
Total Middle Dist.	140,425	139,200	— 0.9	140,000	+ 0.6
Residual Oils	49,370	51,900	+ 5.1	52,000	+ 0.2

*1954 estimated; 1955, IPAA forecast.

PETROLEUM PRODUCT EXPORTS, 1946-1955

(in 1000 bbl.)

	1946	1947	1948	1949	1950	1951	1952	1953	1954*	% Change	1955*	% Change
Gasoline	45,334	47,449	37,302	39,347	24,721	40,136	36,285	37,920	34,310	— 9.5	28,105	—18.1
Kerosine	8,637	7,252	3,495	2,533	2,078	6,843	7,821	7,212	5,475	—24.1	4,380	—20.0
Distillates	29,487	29,877	21,293	12,295	12,653	22,555	33,515	32,269	22,995	—28.7	18,615	—19.0
Total Middle Dist.	38,124	37,129	24,788	14,828	14,731	29,398	41,336	39,481	28,470	—27.9	22,995	—19.2
Residual Oils	9,188	10,623	13,011	12,641	16,228	28,999	27,701	26,208	27,740	+ 5.8	21,900	—21.1
Lubes	11,051	14,262	13,392	12,912	14,252	17,429	16,031	13,015	15,695	+20.6	13,505	—14.0

*1954—8 months actual, 4 months forecast; 1955—forecast.

ELLIOTT B. McCONNELL—of API he says: "There is no more appropriate place for industry to pool its resources"

Elliott B. McConnell

API's newly elected V. P. for refining

YOU don't have to dig deeply into the life of Elliott B. McConnell, newly elected vice president for refining of the American Petroleum Institute, to find out what got him interested in the oil industry.

McConnell, in commercial life the vice president in charge of manufacturing at Standard Oil Co. (Ohio), in Cleveland, got his first whiffs of crude oil in his native Oil City, Pa., where he was born in 1901 and lived the first 14 years of his life. He frankly admits that with producing wells only a short distance from his home, it was literally and figuratively impossible to escape a consciousness of their existence.

After graduation from Cornell in 1923 with a degree in chemical engineering, he joined Standard Oil Co. of New Jersey, starting with a refinery training course lasting six months. He eventually became process inspector of tube and tank units. This work involved visiting about 15 refineries twice a year, acting as a clearing house on new developments in the process, and recommending improvements in operation. It was in this capacity that Standard of Jersey, in 1927, "loaned" McConnell to Sohio to help start up two new cracking coils at Sohio's Cleveland refineries.

So much impressed were Sohio officials by McConnell's work that in 1928 he was offered the job of assistant to the vice president in charge of manufacturing. He held that post until 1945, when he was made general manager of the manufacturing department. In 1946 he was appointed to his present post and also elected a director.

Over his more than 30 years in the oil processing field, McConnell has evolved a deceptively simple business philosophy: "Stay ahead of your competitor." And he believes that processing (and the resultant product) is the most fundamental part of oil industry activity. It is his sincere belief that all the smiling service station operators and fancy advertising slogans in the world won't promote sales, unless the gasoline sold is really better than that being sold on the next corner.

He has a philosophy too about oil men working on API tasks. While admitting that API work places a big burden on the man who must also keep up his own work, he says "I regard it as a part of my regular job to contribute to refining division activities, because what I do for API will eventually help my company as well."

He sees the main purpose of API's Refining Division as twofold: 1—as a forum for the exchange of information between operational men and refinery technologists; 2—as a foundation for good public relations, both between oil company competitors and the general public. "There is no more appropriate place," he states, "for industry to pool its resources."

At this early stage, McConnell is chary of outlining any concrete program for the Refining Division in 1955. In setting forth certain areas of definite interest, he wants it understood that he is not belittling the remainder of the Division's various working committees.

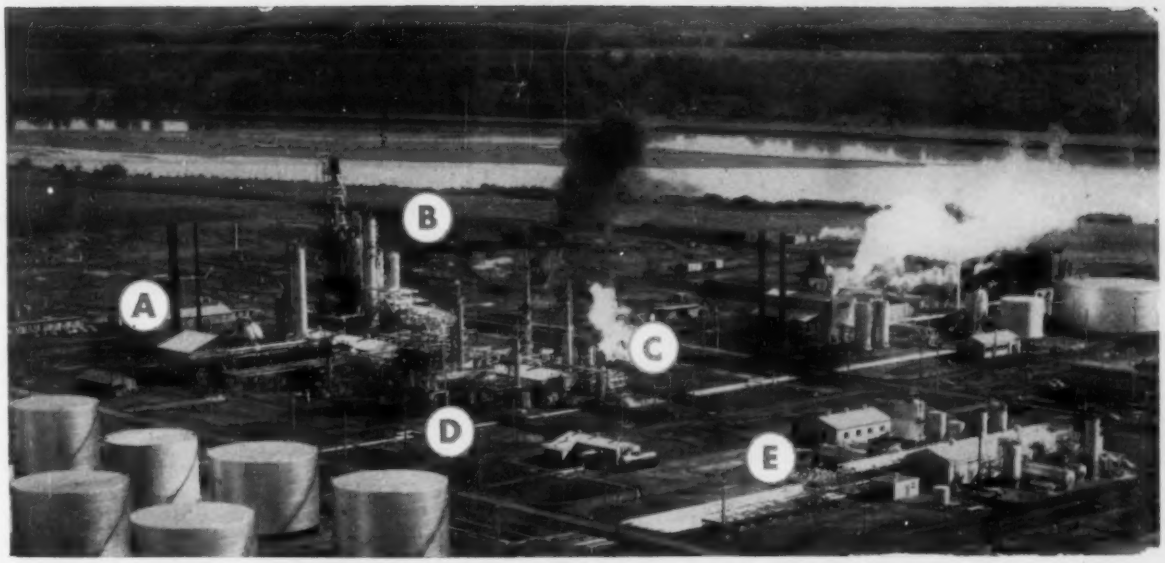
"Perhaps our biggest problem—public relations wise," he says, "is that of waste disposal." McConnell feels oil companies are far less to blame for such situations as recently occurred in Los Angeles than the public realizes. "After all," he says, "it was the oil companies who took the lead, 25 years ago, in realizing that refinery wastes were a cause of air pollution." He thinks other industries have much catching up to do.

HIS API PHILOSOPHY: "I regard it as part of my regular job to contribute to refining division activities"

While he refuses to be quoted on any concrete plans, McConnell does say that he will push for greater cooperation between the Refining Division's waste disposal committee and the central public relations to get the oil industry's story on smog before the general public.

The Refining Division's smoke and fumes committee, which this year is operating on a budget of $250,000, is expected by McConnell to make considerable concrete contributions of a technical nature to aid the industry in its smog elimination efforts.

HIS BUSINESS PHILOSOPHY, evolved over 30 years, is deceptively simple: "Stay ahead of your competitor"



ON STREAM—the brand new 30,000 b/d refinery of Indiana Standard at Mandan, N. Dakota. Numbers identifying various units are keyed to chart below

MANDAN

A new refinery in a burgeoning new refining area

TWO months ago a new refinery was put on stream—the 30,000 b/d plant of the Standard Oil Co. (Indiana) at Mandan, N. Dakota.

Interest in the plant has been high. It is the first large refinery to be built in an area just developing as a refinery center—the Upper Midwest.* It is the first refinery that Indiana Standard has built from the ground up since its refinery at Wood River, Ill. in 1907. And it is the largest refinery in this country to employ a combination processing sequence — one in which the products from one process step move directly to the next process step without going through intermediate storage.

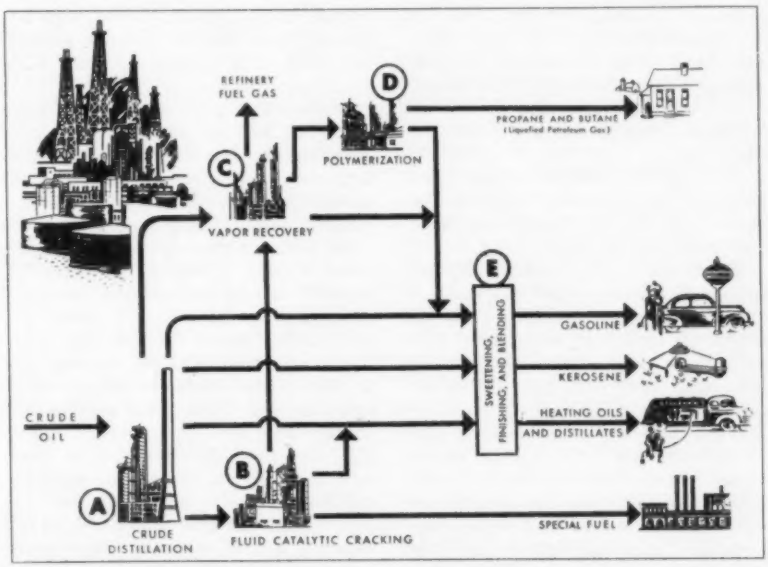
On the following pages are three separate stories describing some of the major features and design details of the Mandan plant:

"Four-in-One" Processing — The combination processing unit, which incorporates crude distillation, Fluid catalytic cracking, vapor recovery and catalytic polymerization into a single sequence.

Three Kinds of Treating—Copper chloride, doctor and caustic, for sweetening gasolines and distillate fuels.

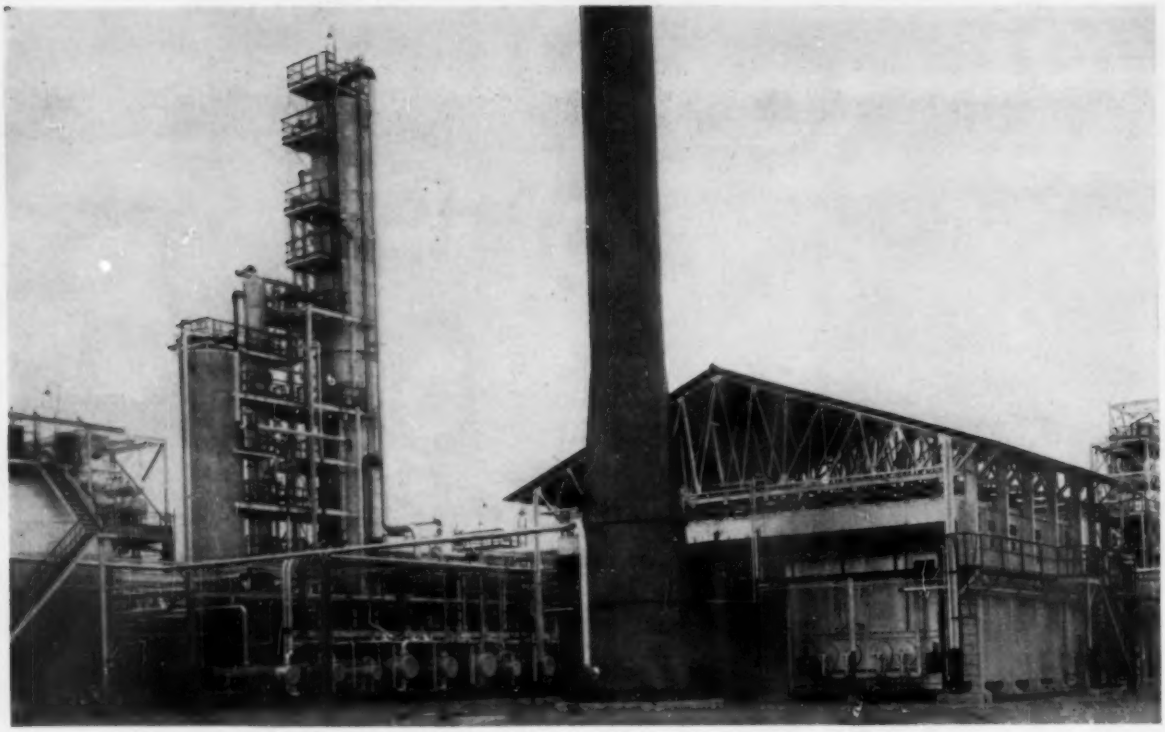
How Mandan Handles Wastes — Getting rid of phenols and caustics in a central system designed as part of the plant.

Design and construction of the plant was handled by the Lummus Co. of New York, which also supplied PETROLEUM PROCESSING's editors with much of the data for these articles.



GENERAL FLOW PATTERN through the Mandan refinery, with units keyed to photo above, and showing sequence of major processing steps

* For a description of this area and the developments taking place in it see "Upper Midwest to 'Refine Its Own'" in the August '54 PETROLEUM PROCESSING, pp. 1185-89.



1 **CRUDE SECTION** of the Mandan combination unit, showing (l to r) desalter sphere, crude flash drum, side stream strippers (3 in 1), fractionator and heater

'Four-in-One' Processing

Mandan combination unit integrates crude still, cracking, vapor recovery, cat polymerization into single sequence

THERE are two main features of the new 30,000 b/d Mandan, N. D., refinery of Indiana Standard which are worthy of special mention:

- It is the largest combination processing unit yet installed in this country.
- The entire bottom-of-the-barrel of crude is used as catalytic cracking feed stock.

Design of the refinery calls for the major processing to be accomplished in a combination unit consisting of four conventional refining operations — crude running, Fluid catalytic cracking, vapor recovery, and catalytic polymerization — all integrated into a single processing sequence.

These various sections of the combination unit are interdependent to such an extent that no major portion of the unit can operate alone, and no intermediate tankage has been provided to allow flexibility in its operations.

There are advantages to such a processing arrangement. By eliminating intermediate tankage, and consequently a large amount of transfer piping, pumps, exchangers and instruments, you cut down the capital investment required for any given size plant.

You are also able to reduce operating and maintenance costs to the extent that there are fewer pieces of equipment to look after.

But there are disadvantages. By not having that intermediate storage you lose flexibility of operation. And if any single section of the combination unit has an unscheduled shutdown, it more than likely will take the entire plant down with it.

When you do have a scheduled turnaround, you have a peak maintenance load—being unable to even it out by staggering the shutdowns and working on one unit at a time.

Indiana Standard figures that the advantages outweigh the disadvantages in their particular case—with a source of good quality crude, with an entirely new refinery from the ground up, and with modern process and equipment design.

Although many modern refinery units can be run for a year between turnarounds, the Indiana Standard engineers are planning semi-annual turnarounds for the Mandan combination unit. They'll probably give each section a thorough overhaul only once a year, catching the catalytic cracker on one turnaround and the other sections on the next. They figure that two weeks downtime on each turnaround will be ample, whereas on a once-a-year basis it would take twice as long. Therein lies one reason for the semi-annual turnaround practice. The Mandan refinery is at present the only outlet on the pipeline supplying it with crude; if the refinery were to shut down for four weeks at a time, it would either have to have sufficient crude storage to handle all of that continuing flow of

crude, or the line—and wells—would have to be shut down.

1—Crude Section

This section of the combination processing unit consists of a desalter, a flash drum, furnace, main fractionator, and a three-section sidestream stripper.

Crude at the rate of 33,000 b/sd is delivered to the crude feed pump, which discharges through a Petreco Electrosphere Desalter to the crude flash drum. By this point, heat exchangers have raised the temperature of the crude to about 325° F., and in the flash drum a portion of the gasoline vapors is flashed off and flows from the top of the drum directly to the crude fractionator. If the light ends weren't flashed off in the flash drum and by-passed around the furnace they would vaporize in the transfer line to the furnace and interfere with control of flow into four parallel coils.

No back pressure is maintained in the tubes in the crude heater; the heater floats on the fractionator via the transfer line. The heater is fired with fuel oil or gas, or both, under automatic temperature control.

The crude fractionator is of the conventional bubble cap tray type. There are 20 trays located above the flash zone, and four stripping trays below.

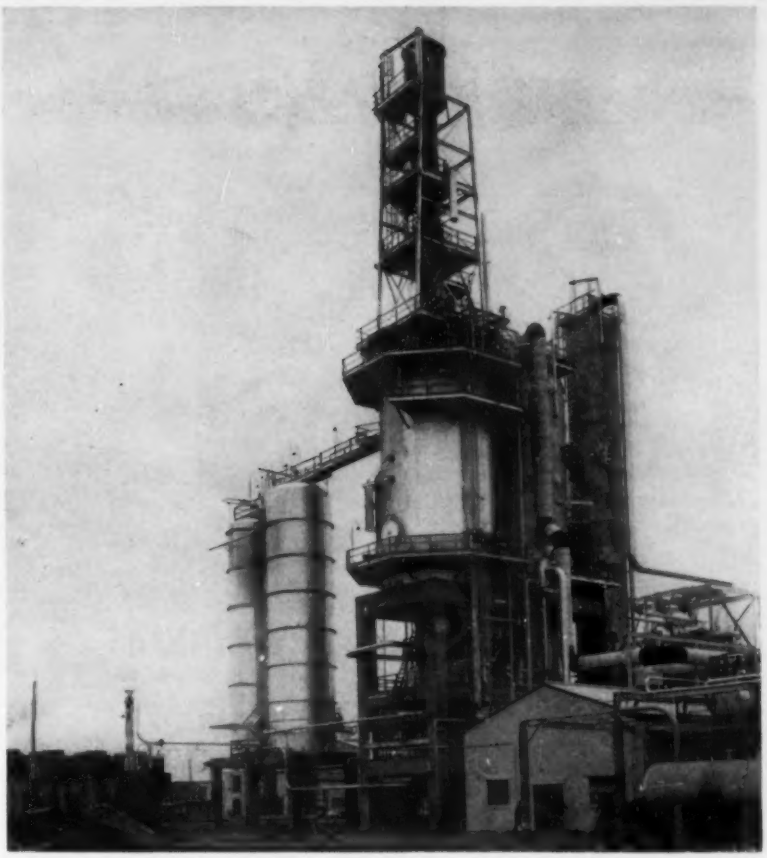
Overhead product from the crude fractionator is light virgin naphtha, which is withdrawn through condensers to an overhead accumulator, and eventually pumped to the vapor recovery section. Wet gases likewise go to vapor recovery.

Heavy naphtha is withdrawn through the top sidestream stripper to storage for subsequent gasoline blending and treating.

Kerosine or heater oil is withdrawn through the middle sidestream stripper and goes directly to the treating plant.

Virgin gas oil is withdrawn through the bottom sidestream stripper at the rate of 2,475 b/sd, and goes through sweetening to storage, although a portion of it may be used as cat cracker feed stock.

Reduced crude flows from the bottom of the fractionator to a surge drum, from which it is pumped under flow control to the cat cracker. Pressure is maintained on the flash zone of the crude fractionator by a pressure controller which actuates the regulating valves in the off gas lines leading from the overhead accumulator to the gas compressor at the vapor recovery section. The top temperature of the fractionator is automatically controlled by a temperature controller which regulates the amount of reflux to the top tray.



2 CATALYTIC CRACKING SECTION, showing (l to r) fresh and spent catalyst hoppers, regenerator, reactor, fractionator, with pumphouse in foreground

2—Catalytic Cracking Section

The Fluid catalytic cracking section at Mandan is typical of the modern Fluid design—with low side by side reactor and regenerator. It has an unusually high rate of catalyst circulation, however—on the order of 17 tons/min. Synthetic silica-alumina catalyst is used.

Charge stock to this section consists of a mixture of fresh feed and cycle stock. The fresh feed includes all of the reduced crude plus an optional charge of virgin gas oil. Cycle stock includes 8,950 b/sd of heavy cycle oil and 50 b/sd of slurry recycle.

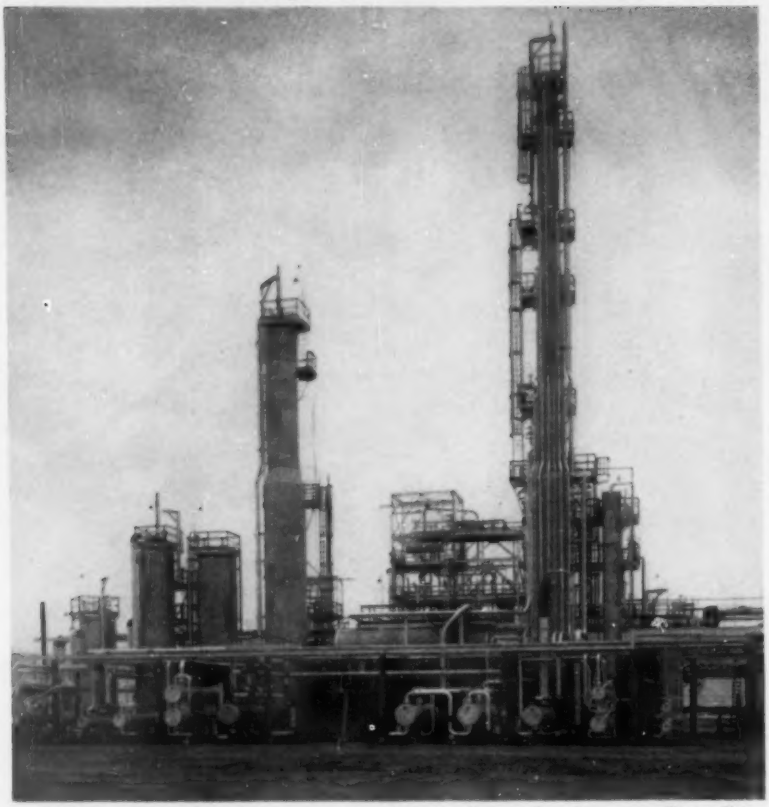
The volume of catalyst bed in the reactor is controlled by a level controller which regulates the spent catalyst slide valve at the base of the spent catalyst standpipe. Catalyst in the reactor flows down into the reactor stripper, where it is countercurrently steam stripped of entrained hydrocarbons, the stripped spent catalyst flowing by gravity into the spent catalyst standpipe. From there it enters the spent catalyst transfer line and is blown into the regenerator.

It is estimated that on this unit approximately 31,000 scfm. of total air supply to the regenerator will be needed to properly regenerate the catalyst under normal conditions. An excess of oxygen amounting to about 1.0% to 2.0% is maintained in the flue gas to assure maximum carbon burn-off, and an oxygen recorder is provided so that a constant check may be kept on the excess oxygen in the flue gas.

Removal of catalyst fines from the vapors leaving the vessels is accomplished by means of the usual cyclone separators. There are eight sets of two-stage cyclones in the regenerator, and four sets in the reactor.

The fractionation equipment of the catalytic cracking section consists of a primary fractionator and slurry oil settler, a fractionator reflux accumulator, and a two-section sidestream stripper.

Vapors from the Fluid unit reactor enter the bottom of the fractionator, where they are cooled and washed



3 **VAPOR RECOVERY SECTION,** showing (l to r) splitter reflux drum, gasoline splitter, debutanizer reflux drum, debutanizer, feed flash drum (horizontal), main absorber (tallest tower), and sponge absorber

free of catalyst by the slurry oil reflux. This reflux is the oil from the fractionator bottoms circulation after having been cooled by exchange with raw crude in the crude distillation section. Sufficient cooling is done by the slurry reflux and the downflow from the trays above to desuperheat the entering vapors from the reactor and to condense the slurry recycle and decanted oil.

The slurry settler is incorporated in the base of the fractionator tower and is fed by gravity flow. Since the top of the settling compartment is vented to the fractionator, the settler operates flooded and at tower pressure. The settler feed rate is the sum of the withdrawals of slurry oil and decanted oil. The slurry oil is recycled to the reactor charge line. Decanted oil is pumped, under level control, through a cooler and out to storage.

Heavy cycle oil is withdrawn from a collecting pan one tray above the baffled desuperheating section of the fractionator. About 8,950 b/sd of this heavy cycle stock is recycled to the reactor charge line. The remainder of this stream is used in the vapor recovery unit as a source of heat before returning to the fractionator as intermediate reflux. Just before this stream is returned to the fractionator, a portion is withdrawn to storage, and a small stream is diverted for flushing oil to pumps, valves and instruments.

Medium cycle oil is withdrawn through the lower sidestream stripper, where it is steam stripped for flash point control before being pumped through a cooler to storage, or to the treating plant for caustic treating.

Light cycle oil likewise is withdrawn through a sidestream stripper and steam stripped for flash point control. From the stripper it is pumped through the polymerization section depropanizer reboiler, light cycle condensate exchanger, and light cycle product and sponge oil cooler. From the cooler, approximately 3,075 b/sd of the light cycle oil is used as sponge oil in the vapor recovery section sponge absorber, with the rich sponge oil being returned to the fractionator. Net light cycle oil is pumped to the caustic treating unit.

Overhead from the fractionator is partially condensed and then passes into the overhead reflux accumulator. Uncondensed vapors are sent to the suction of the main gas compressor. Reflux from the accumulator is pumped back to the top tray in the tower, the quantity being determined by the tower overhead temperature controller. The net unstable gasoline product is pumped to the top of the vapor recovery section absorber.

3—Vapor Recovery Section

The vapor recovery section is designed to separate specification gasoline products from the mixture of crude and cracked gas and gasoline produced in the crude and catalytic cracking sections already described. Products from the vapor recovery facilities are a dry gas for fuel, liquid propane-propylene and butane-butylene for charge to the catalytic polymerization section, debutanized light naphtha, and stabilized heavy naphtha. The latter two leave as specification gasoline blending stocks.

This section consists of an absorber, where liquid feed and gas feed are run counter-current to absorb gasoline fractions from the gas; a sponge absorber, where the gas is further cleansed of its desirable constituents; a debutanizer, where a butane-propane fraction is removed for cat poly charge; and a splitter tower, which separates the debutanized light naphtha and stabilized heavy naphtha fractions.

Wet gas from the overhead accumulators on the crude and catalytic section fractionators is compressed in a multi-stage centrifugal compressor, combined with gas from the stripping section of the absorber and an unstable gasoline stream from the top section of the absorber, and flows through condensers into the absorber feed flash drum.

The gas passes overhead from the flash drum and into the lower portion of the absorber top section (tray 28). It flows upward, counter-current to the lean absorption oil, which consists of a stream of unstable gasoline from the Fluid section fractionator (entering the top of the absorber) and a stream of light virgin naphtha from the crude section entering at the midsection of the absorber. The bulk of the C_3's and C_4's are absorbed here.

Off-gas from the absorber flows next to the sponge absorber, where it is contacted by the downward flowing lean sponge oil (light catalytic cycle oil). Off-gas from the sponge absorber goes to refinery fuel. Rich sponge oil is returned to the Fluid section fractionator.

Rich absorption oil from the bottom of the main absorber flows to the absorber feed flash drum, and is then pumped to the stripping section of the absorber. Sufficient heat to operate

the stripper is obtained by reboiling the absorber bottoms, the heat being supplied by hot heavy catalytic cycle oil. Stripped gas is returned to the incoming feed line to the absorber.

Unstable gasoline from the stripper is pumped to the debutanizer. Heat to operate this tower is obtained by reboiling debutanizer bottoms, the heating medium being fractionator bottoms from the Fluid section. The gasoline level in the debutanizer bottom is held constant by level control, net make being sent under pressure to the gasoline splitter.

C_3's and C_4's removed from the unstable gasoline in the debutanizer are taken overhead, through water-cooled condensers, and to the debutanizer overhead accumulator. About two-thirds of this stream is refluxed to the top of the debutanizer; the remaining third is pumped to the catalytic polymerization unit as feed stock. Pressure in the debutanizer is held by a pressure controller which regulates the flow of water through the overhead condensers.

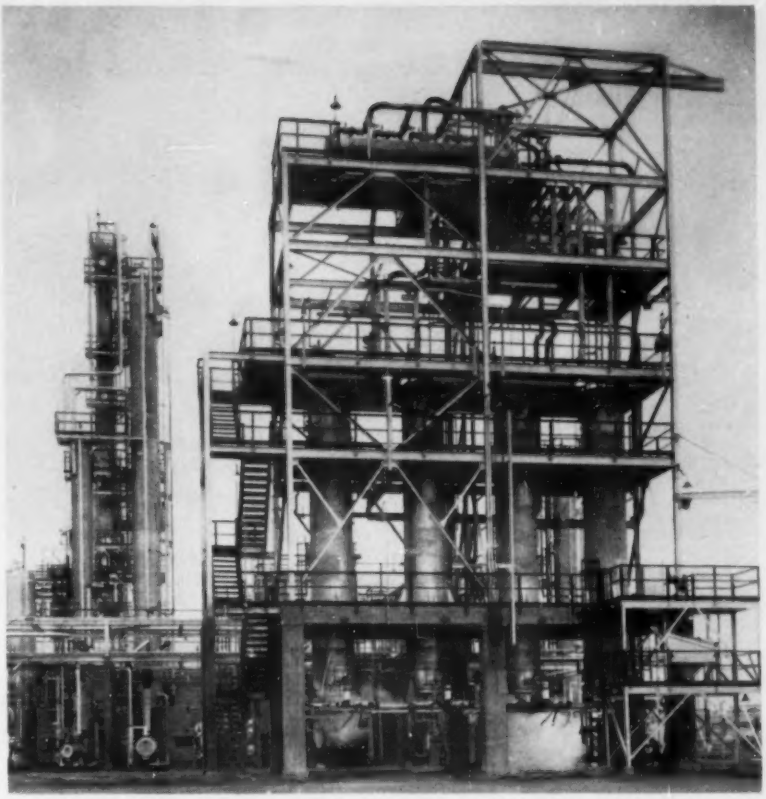
Debutanizer bottoms are fed to the gasoline splitter. Heat is supplied here by reboiling with hot heavy catalytic cycle oil. Debutanized light naphtha is taken overhead from the splitter, cooled, and collected in the splitter reflux drum. Part is returned to the splitter as reflux, and the balance is pumped to storage as debutanized light naphtha product. Bottoms from the splitter are cooled and pumped to storage as stabilized heavy naphtha product.

4—Polymerization Section

The catalytic polymerization section at Mandan consists of three main parts—feed desulfurization, reaction, and fractionation.

The desulfurization portion removes undesirable hydrogen sulfide and carbon dioxide from the feed by contacting it with diethanolamine, which absorbs the acidic contaminants. The diethanolamine is then heated to drive off the absorbed contaminants, which are burned, and the regenerated amine solution is returned to the process.

In the reaction portion, desulfurized feed is contacted with phosphoric acid catalyst under high pressure. The acid is impregnated in clay pellets, and the pelletized catalyst is placed inside the tubes of the reactors, which are in effect heat exchangers. Four reactors are provided in parallel. As the hydrocarbon feed flows through the tubes, the polymerization reaction takes place with the release of considerable heat. Water on the shell side of the reactor-exchangers is boiled by the heat produced in the reaction, and the steam formed is used to preheat the feed to the reactors.



4 **POLYMERIZATION SECTION,** showing four polymerization reactors in foreground; two towers in left background are poly gasoline debutanizer and depropanizer (the taller), with main absorber in vapor recovery unit in far background behind them

From the reactor system, the mixture of polymer and unreacted light hydrocarbons flows to the polymerization section depropanizer, where propane is removed for use as liquefied petroleum gas or refinery fuel. In the next tower, butane is taken overhead as product or for fuel, and polymer gasoline is removed as bottoms product.

The combined C_3's and C_4's produced at the vapor recovery section flow upward through the diethanolamine absorber, counter-current to a lean solution of diethanolamine flowing downward.

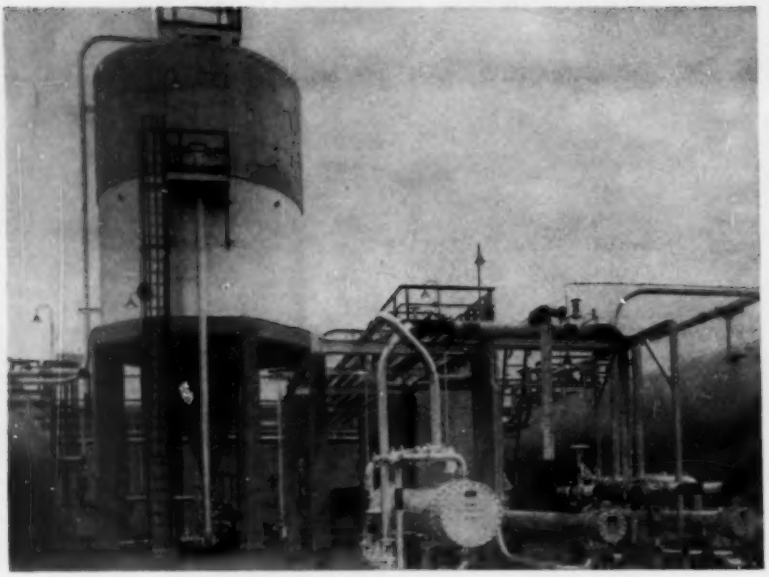
The hydrocarbon stream from the absorber flows through a coalescer to remove any entrained diethanolamine, through a caustic wash tower to remove mercaptans and any remaining hydrogen sulfide, through a water wash column to remove basic nitrogen compounds, through a second coalescer, and finally to the reactor feed accumulator.

Feed is pumped from the accumulator, through preheat exchangers, and to the tube side of the polymerization reactors. Temperature control in the reactors is obtained by the pressure under which steam is generated in the jacket system around the reactor tubes.

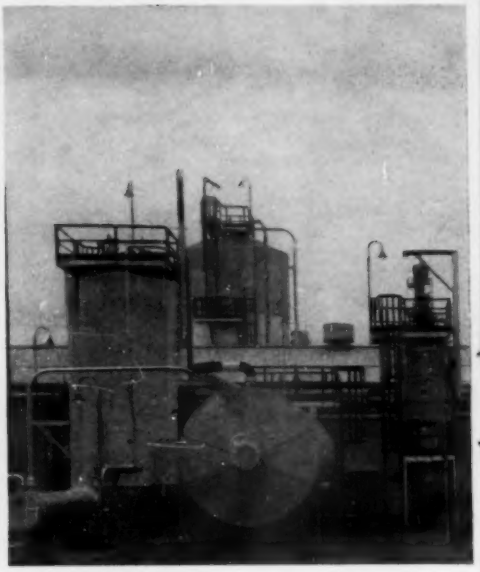
Polymer gasoline formed in the reactors and unconverted materials flow through the feed preheating exchanger and a cooler to the depropanizer. A reboiler system in this tower provides heat for vaporizing unreacted propane by exchange with light catalytic cycle oil. Propane overhead may be either condensed for use as LPG product or vaporized for use as refinery fuel.

Depropanized polymer gasoline flow from the bottom of the depropanizer to the polymer gasoline debutanizer. A reboiler in this system provides heat for vaporizing butanes by exchange with fractionator bottoms from the Fluid unit. Butane overhead, like propane in the previous tower, may be either condensed and pumped out as product or vaporized into the fuel gas system.

Debutanized polymer gasoline (1,163 b/sd) is withdrawn from the bottom of the debutanizer and run to storage.



1 COPPER CHLORIDE SWEETENING, showing (l to r) water settler, cone bottom settler, 3 exchangers, and salt dryer



2 CONTINUOUS DOCTOR TREATING, showing (l to r) No. 2 settler (hori-

Three Kinds of Treating

PRODUCT treating facilities at the new Mandan refinery of Indiana Standard are separate from the combination processing unit, and consist of three installations:

1—Copper Chloride Sweetening, for blended or individual gasoline stocks.

2—Continuous Doctor Treating—for heater oil, kerosine, or virgin gas oil.

3—Caustic Treating—for catalytic cycle stocks for use in distillate fuels.

The first treating system operates independently of the combination unit, charging feed stocks from storage in blocked out operations. The doctor treating system usually takes feedstock directly from the side-stream stripper in the crude distillation unit. The two caustic treating units take feed stocks directly from the main fractionator in the catalytic cracking section of the combination unit.

1—Copper Chloride Sweetening

The copper chloride sweetening process is used for sweetening gasoline blending stocks. It is a continuous process in which the mercaptan sulfur in the gasoline is converted to disulfides in a chemical reaction with copper chloride. The intermediate mercaptide salts of copper are simultaneously reactivated to copper chloride in the presence of oxygen.

Rated capacity of this unit is 25,000 b/sd of 57° API gravity gasoline. Feed stock will be any one or a blend of the following sour gasoline streams:

1—Debutanized light naphtha.

2—Heavy virgin naphtha.

3—Stabilized heavy naphtha.

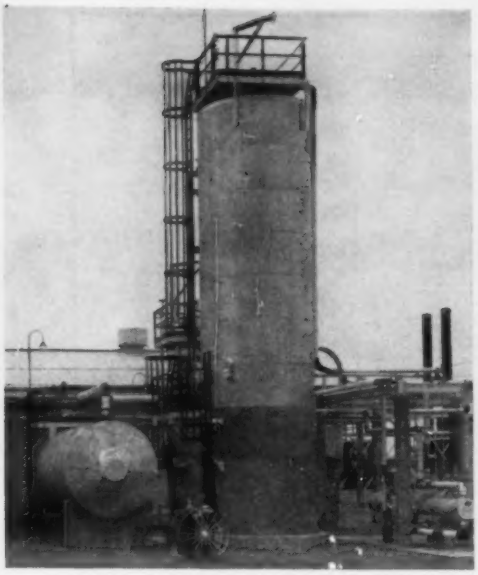
Feed stock enters the unit through a shell and tube steam heater, picks up a recirculating stream of caustic solution, passes through a mixing nozzle, and then enters a long caustic settler. The caustic wash removes hydrogen sulfide from the gasoline charge stream, separates to the bottom of the settler, and is continuously pumped back to the incoming feed line. Spent caustic is rejected at the discharge of this circulating pump, and a 10% by weight caustic solution is added when analysis of the circulating stream indicates it is necessary.

The gasoline stream flows overhead from the caustic settler to a salt dryer (filled with rock salt), where any mechanically suspended caustic is removed. As the gasoline is pumped from the salt dryer, oxygen is added, and the feed then passes through another shell and tube steam heater where it is heated to somewhere between 100 and 125° F. This heating is necessary because the chemical reaction which follows results in the formation of water, and the temperature of the gasoline must be high enough to keep this water dissolved in the gasoline and thus continuously removed from the system.

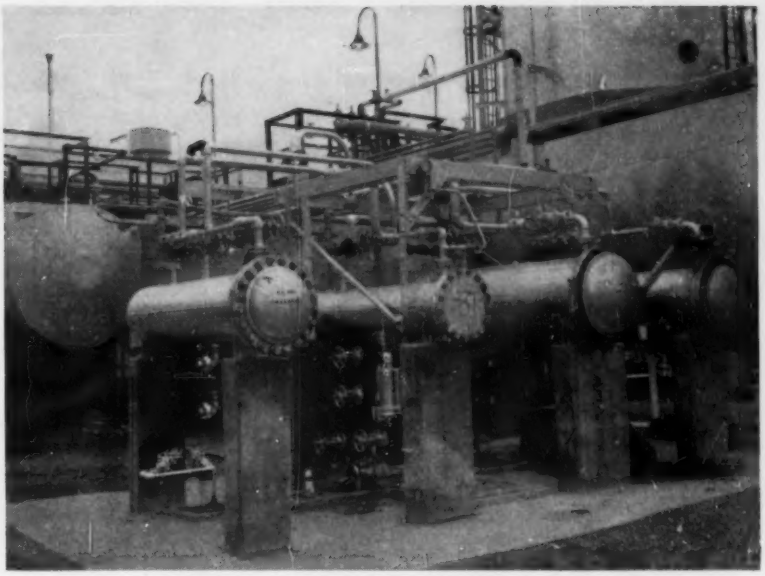
From the heater, the gasoline and oxygen pass through an eductor at the bottom of a cone-bottom settler, where they are mixed with copper chloride-clay slurry from the bottom of the settler. The gasoline is sweetened almost simultaneously, and the mixture of gasoline and slurry flows into the settler near the top. Sweetened gasoline goes out the top, and the slurry drops down to be recirculated through the eductor again.

The copper chloride-clay slurry gradually loses its activity because of a surface coating of foreign material. Its activity is renewed or supplemented by the addition of fresh slurry, which is a mixture of 200 mesh contact clay or fuller's earth and 40-60 mesh commercial copper chloride.

Sweetened gasoline from the top of the cone settler passes through a mixing nozzle, where it is mixed with wash water, and then to a settler. Water settles out and is recirculated to the sweetened gasoline stream. Finished gasoline stock from the water settler is taken overhead, and is passed through a salt dryer, where any entrained water is removed, before going to storage. A small amount of metal deactivator is added at the outlet of the final salt dryer to deactivate the minute quantities of dissolved copper compounds not removed by



zontal vessel), No. 2 mixer, No. 1 settler and mixer, doctor solution regenerator



3 **CAUSTIC TREATING** (two parallel units), showing four coalescers in foreground and caustic settlers in background and to the right

How the new Mandan refinery finishes gasoline, heater oil, kerosine, virgin gas oil, and catalytic cycle stocks

the water wash. Gasoline inhibitor will also be added at this point.

2—Continuous Doctor Treating

This process converts odorous mercaptans in heater oil, kerosine, or virgin gas oil to odorless disulfides. Sodium plumbite added to the mercaptans forms lead mercaptides, which in turn react with free sulfur to form disulfides and lead sulfide. The lead sulfide thus formed is regenerated to sodium plumbite in reaction with oxygen and sodium hydroxide. A fresh doctor solution consists of about 6 wt.-% lead oxide and 10 wt.-% sodium hydroxide in water.

In this section of the treating plant the charge stock of heater oil, kerosine or virgin gas oil is fed in at a rate of 12,500 b/sd (based on 40.7° API gravity stock). It passes through a shell tube steam heater, where it is heated, and then through a coalescer. After this it is joined with free sulfur solution and regenerated doctor solution as it flows into the bottom of the No. 1 doctor mixing tank with an agitator mounted on top. From here the mixture flows into the No. 1 doctor separator, where the spent doctor solution settles to the bottom and is drawn off. The partially-sweetened oil stream is taken off at the top and mixed with a second and circulating stream of doctor solution before going to the No. 2 doctor mixing tank and the No. 2 doctor separator.

The sweetened oil stream from the top of the second separator passes through a product cooler, and finally through a coalescer containing rock salt to remove the last trace of suspended doctor solution before going to storage.

Regeneration of the doctor solution is an important phase of the system. Spent doctor solution from the bottom of the No. 1 doctor separator is drawn off by a circulating pump, which discharges through a shell and tube steam heater. In this doctor heater, the solution temperature is raised to about 250° F. Plant air is added before and/or after the heater, and then the solution flows to the doctor regenerator.

The regenerated doctor solution, together with residual air, leaves the top of the regenerator under sufficient pressure to enter the incoming oil charge stream ahead of the No. 1 doctor mixer. The air is bled from the top of the mixer to the blowdown stack by level control.

The circulating doctor solution in the No. 2 system is intermittently pumped to the regenerator system and replaced with fresh solution.

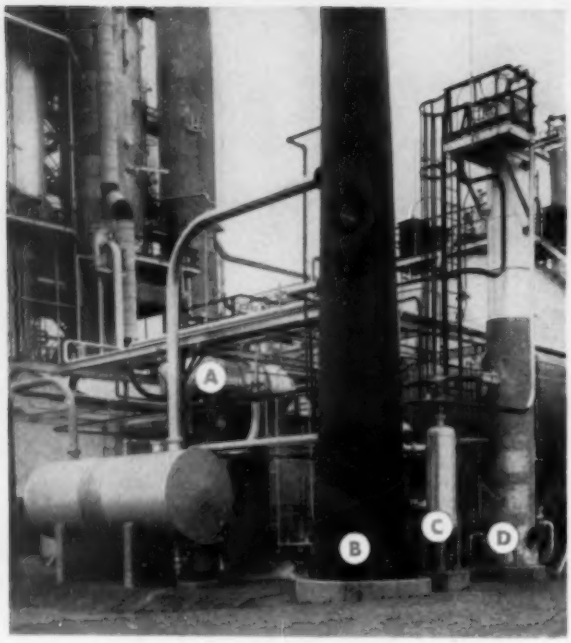
3—Caustic Treating

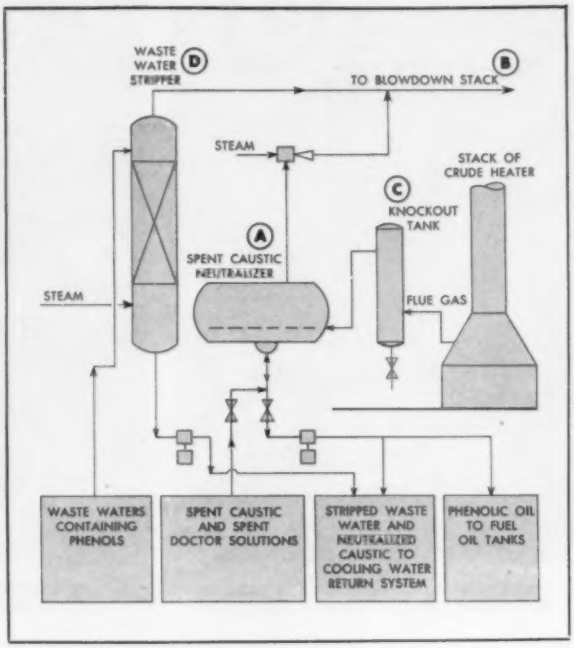
Two parallel caustic treating units are provided for sweetening catalytic cycle stocks for use in distillate fuels, one unit is employed for sweetening light catalytic cycle oil, and the other is utilized for medium catalytic cycle oil. Caustic of 25 wt.-% strength is used. Facilities have been included whereby a metal deactivator is added to each product stream to deactivate any copper or other metals which may have been picked up in the exchangers, piping, vessels, or from the crude stock in preceding process units.

The caustic treating section in essence is a simple unit. The light catalytic cycle oil stream passes through a coalescer, is mixed with a circulating caustic stream, and then passes through two mixing nozzles enroute to the caustic settler. The oil separates to the top in the settler, is removed through a coalescer to take out any entrained caustic solution, picks up metal deactivator added through a proportioning pump, and goes to storage.

Caustic is removed from the bottom of the settler by a circulating pump with discharges into the charge oil stream. Fresh 25 wt.-% caustic solution is added at this pump as needed to maintain the strength of the circulating caustic.

A similar unit is provided for treating about the same amount medium catalytic cycle oil, differing only in sizes of lines and vessels due to the increased flow.





PHENOLS AND SPENT CAUSTICS don't get away at Mandan; this system knocks them out

How Mandan Handles Wastes

DISPOSAL of waste waters containing phenols and of spent caustic solutions are handled in a central system designed as part of the plant in the new Mandan refinery of Indiana Standard.

Phenols are particularly troublesome around a refinery because of the vile taste after chlorination they impart to water even in very minute concentrations. Because of that property, they usually can't be just dumped into the regular plant waste disposal system, which would simply pass them on through with the effluent.

At Mandan, the problem has been solved by setting up a system for collecting all process water from the combination unit (water which has come into direct contact with the hydrocarbon streams and therefore has possibly picked up some phenols), and keeping it separate from other waste water. The phenol-containing water is run through a waste water stripper in which steam strips out any contained sulfur compounds. This stripper is a 3 ft. diameter by 22 ft. high column, packed with Raschig rings. Overhead from the stripper is discharged to the atmosphere through an adjacent blowdown stack.

The stripped waste water, still containing the phenols, is then fed into the cooling water return system as part of the cooling water makeup. Because of the aeration provided in the cooling water tower, the phenols are consumed by bacteria capable of digesting organic matter, and are therefore disposed of without discomfort to anyone.

The system is designed to handle all waste water from the following parts of the combination unit:

Crude section overhead accumulator.

Fluid section fractionator reflux accumulator.

Vapor recovery section feed flash drum.

Depropanizer overhead accumulator.

Polymerization section reflux accumulator.

Polymerization section feed coalescer.

Depropanizer coalescer.

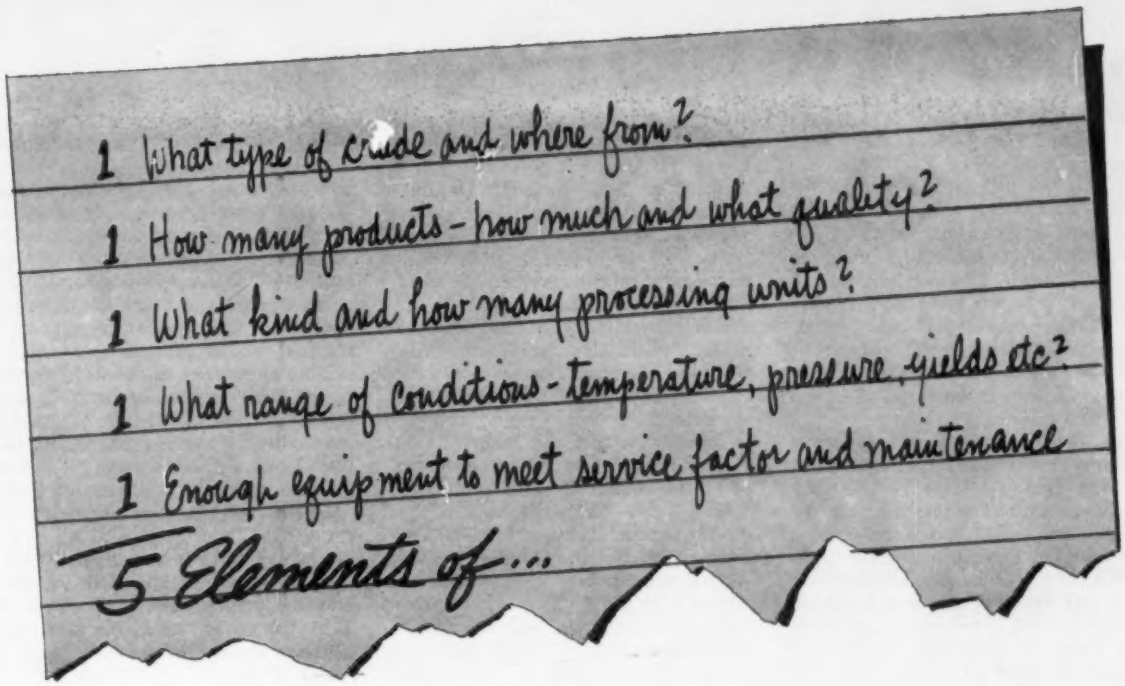
Debutanizer overhead accumulator.

Since the volume of waste water involved is relatively small, on the order of 60 gpm, it can be easily absorbed by the cooling water system. The only problem likely to arise is that the phenols might not be digested by the bacteria fast enough to prevent the phenolic content of the system from progressively accumulating.

Waste caustic solutions from around the plant are collected and neutralized by blowing with flue gas from the crude charge heater—the carbon dioxide content of the flue gas effectively converting the caustic to sodium carbonate. At the same time, any phenols contained in the caustic solution selectively separate out in a phenolic oil layer, which is subsequently separated and burned.

Caustic neutralization is handled as a batch operation. When sufficient solution has been accumulated to fill the spent caustic neutralizer drum, which is 5 ft. diameter by 12 ft. long, flue gas is drawn from the crude heater stack, through a water-wash knockout drum, and into the neutralizer tank. Suction for drawing the gas into the system is provided by a steam ejector, which is above the neutralizer tank and vents into the same blowdown stack used for venting the waste water stripper.

After neutralization is complete, the neutralized caustic solution is drawn off and pumped to the cooling water return system, so that any dissolved phenols are disposed of by bacterial action, and the phenolic oil layer is pumped to fuel oil tanks for subsequent burning as fuel around the plant.


1 What type of crude and where from?
1 How many products - how much and what quality?
1 What kind and how many processing units?
1 What range of conditions - temperature, pressure, yields etc?
1 Enough equipment to meet service factor and maintenance
5 Elements of ...

Flexible Refinery Design

by J. W. PACKIE and D. L. CAMPBELL

DURING the past quarter century, the art of process design of oil refining facilities has emerged from a "black art" into a highly complicated science.

The challenge to continue improvements in process techniques emphasizes the need for flexibility in process designs. However, the degree of flexibility that is incorporated in the design must be justifiable, known and well defined.

The major broad categories for which design flexibility must be evaluated are:

1—Variation in crude type and source.

2—Products in realistic number, quantity and quality.

3—The optimum number and choice of processing units.

4—A suitable range of operating conditions such as temperature, pressure, yields, heat inputs, etc.

5—Adequate provision of equipment to assure meeting design service factor and economic maintenance.

1—Crude Type and Source

There are always financial pressures on the refiner to run the most profitable crude available. The optimum crude differs with time because of changing market situations and development of new oil fields. If the refiner has unlimited equipment available, it might be more profitable to run a light sweet crude one month and a heavy sour crude another month. However, to provide flexibility for all types of crude oil would be excessively expensive. The designer should consult with the marketing and producing interests to see what crudes deserve most consideration. Economic studies should be made to determine the actual investment and operating costs for running each type of crude to estimate the profit margin.

Running two different crudes of about the same boiling range, one sweet and the other sour, necessitates additional processing steps for sulfur removal. Alloy corrosion protection must be provided.

As an example, reference is made to the 1951 report of the American Petroleum Institute's Million Barrel Committee on New Refining Capacity.

Please turn page:

Why Flexibility

The increased demand for higher quality petroleum products has made it necessary to develop techniques and methods for arriving at optimum design flexibility. The designer has the difficult task of providing the proper balance between flexibility and investment.

Forty years ago crude oil was processed through simple units. Product yields were determined by equipment performance and crude type rather than by market considerations. Some excess gasoline produced was dumped at sea or burned. Today, the competitive situation requires that every drop of oil be converted into salable products.

Twenty-five years ago a distillation unit was designed by a single man in a period of about 3 or 4 weeks with a few pencilled notes and sketches turned over to the draftsman. Units were placed in operation in a short time. However, details were given very little consideration due to insufficient experience or knowledge. Often the capacity flexibility of the unit was excessively large, the service factor was low and the maintenance high.

Through the experience gained by these past mistakes and deficiencies, the present-day science of process design has developed. It is primarily because of good designs today that the cost of gasoline, excluding taxes, is approximately the same as it was twenty years ago; and due to higher quality, two gallons of gasoline will do the work requiring three gallons of gasoline twenty years ago.

This report showed that for a 50,000 b/d refinery (see Table 1) the investment increase for a sour crude refinery is about 2.5% more than for sweet crude. This considers only the additional requirements for corrosion protection and a minor adjustment for caustic treating gasoline. Assuming the same products from both crudes, the 2.5% increase does not include additional treating which would be necessary for kerosine from sour crude, or the problem of pollution with sour crudes.

To make specification kerosine, a separate study indicates an investment increase of about 8.5% for the sour crude refinery. The operating cost of the refinery would also increase from additional investment and manpower.

If a refinery must alternate between light and heavy crudes and yet meet similar market requirements, a different kind of flexibility is needed. Equipment must be provided for the heavier crude to crack some of its higher boiling cuts. The refinery which can run either light sweet or heavy sour crude will cost considerably more than a refinery designed for light sweet crude only. The additional cost can sometimes be justified in that added flexibility permits the refiner to pick the cheapest crude to run at specific times, and allows him to produce products which take advantage of seasonal or price and demand fluctuations.

2—Product Requirements

Gasoline yields have increased from about 15 to 45% on crude in the past 40 years. Quality has also changed over this period. The industry octane number on regular grade gasoline has risen from 50 to 85. The quality in early days was that resulting from a simple distillation yielding a 50 octane number product. Today's 85 octane gasoline represents a synthetic product from a sequence of processes. Products such as lubricating oil, kerosine and heating oil are being improved also to meet competition.

The oil industry is faced with seasonal fluctuations in demand with higher heating oil requirements in the winter and higher gasoline requirements in the summer. All products vary with the business cycle. In some fields, such as greases and lubricating oils, customers call for products meeting a special formula. This means deciding how many lines of greases to make. There must be a compromise with the sales department for some intermediate number of products and some flexibility to take care of changes in product demand and quality.

For product flexibility problems, designers should indicate the incremental cost of product volume capacity or storage, product quality and product variety. Refiners and marketers then can agree on some reasonable intermediate point.

The problem of flexibility in product yield structure and quality revolves around process unit flexibility and whether it is profitable. An example for a new refinery is shown in Table 2.

Base Case A is a conventional refinery processing a sour crude. Kerosine cannot be made with this equipment. The gasoline pool octane number is about 90 CFRR at the 2 cc TEL/gal. level; and fuel gas (fuel oil equivalent) is about 510 b/d above refinery fuel requirements.

Case B utilizes the excess gas and provides more gasoline octane number flexibility. It contains the same equipment as Case A, with the addition of a polymerization plant to convert light olefins to gasoline. This permits reducing the crude and catalytic cracking feed rates while making the same quantities of all products except bunker fuel oil. No excess gas is made, and the gasoline pool octane number can be reached with 40% less TEL. Using the full amount of lead will yield 92 octane number.

This flexibility is obtained by a 16% increase in capital investment giving a 15.8% return on the incremental investment. Thus the addition of flexibility shows a profit.

Case C demonstrates "product capacity flexibility." An additional processing unit has been included for 1340 b/d kerosine. To maintain the yield of other salable distillate products, this necessitates 2700 b/d additional crude feed over Case B. Bunker fuel oil production has increased 1170 b/d and all major processing units have about 13% greater capacity than Case B.

Case C refinery has flexibility over Case A for octane number, kerosine production and additional crude capacity. Case C can either make the kerosine from the additional 2700 b/d crude, or make that much more middle distillates and fuel oil product than Case B.

For both product capacity (kerosine) and octane number flexibility, the investment increase of Case C over Case A is about 32%. The return on the Case C incremental investment is about 13.3%.

3—Selection of Process Units

To meet product requirements when processing the selected varieties of crudes, a certain combination of processing units can be employed. In arriving at the optimum design, the applicability and comparative economics of available competitive units should be considered.

The worth of the "inherent flexibility," or the operability of the process over a wide range of feed stock characteristics, is often difficult to assess. In the selection of a gasoline sweetening process we would consider its ability to handle both virgin and cracked stocks, even though the initial need is for virgin stock. This explains why Doctor sweetening is still being installed in modern refineries, although it is one of our oldest sweetening processes. In choosing the optimum sweetening unit, the designer must consider product quality degradation, plant investment, and operating cost. For example, the octane debit from Doctor treating would be compared with the octane credit from

Table 1—Investment comparison for sweet and sour crude refineries—Gulf Coast

Crude type	SWEET	SOUR
Refinery capacity, barrels/calendar day	50,000	50,000
Refinery investment, millions $	34.3	35.2
Salable products, liquid volume % on crude		
Gasoline	48	48
Kerosine	5	5
Middle distillate	20	20
Residual fuel oil	21	21

Table 2—Investment vs. product & quality flexibility

Case	A	B	C
Crude capacity, b/cd	21,400	19,800	22,500
Description	Base case, no poly or kerosine plant	Base case plus poly plant	Base case plus poly and kerosine plant
Investment, millions $	15.5	18.0	20.5
Product yields, b/cd			
Gasoline & jet fuel	9,640	9,640	9,640
Kerosine	0	0	1,340
Diesel, varsol, asphalt, etc.	2,560	2,560	2,560
Bunker fuel	8,080	7,170	8,340
Excess gas	510	0	0
Total	20,790	19,370	21,880
Profit, $/calendar day	5,860	6,940	7,680
% return on incremental invest.	—	15.8	13.3

certain extractive sweetening processes having feed stock flexibility.

Initial cost of the plant is the first consideration in the comparison of processes for a specific job. Where the investment and operating costs are comparable, the superior inherent flexibility of one unit would dictate its choice. If an appreciable incremental investment is involved for the more flexible unit, a management policy decision involving a study of contemplated future refinery operations is required.

The designer can choose between a conventional or a catalytic combination unit refinery to evaluate the proper balance between optimum investment and desired flexibility. The decision depends upon location, size, and product requirements. If the refinery management is willing to lose some flexibility in product yield and quality, the combination unit refinery usually requires considerably less capital investment than a conventional refinery.

Table 3 illustrates this point with a 25,000 b/d prime fuel refinery running sour crude*. The product yields for the conventional unit refinery including facilities to increase light products and reduce fuel, are such that the product credits are about 21 cents/bbl. higher than for the combination unit refinery. However, the combination unit refinery requires about one-third less capital investment and 30% lower operating cost. When the greater flexibility of the conventional refinery with vacuum distillation, visbreaking, and polymerization is evaluated against these substantial savings, the combination unit appears more attractive.

Combination units are not always best. Refineries making a large proportion of lubes, asphalts and other specialty products, or running heavy crudes in minimum fuel oil market areas would have to be of the conventional type. A refinery with product flexibility has defense against sharp declines in product prices, and opportunity to maximize the production of high priced products*.

The number of individual units for each process should be considered after selecting the type of refinery and processing units. The initial distillation could be in one pipe still or in two or more parallel pipe stills. In most cases the authors have found a minimum number of units to be economically desirable. Blocked operations in a single unit are generally preferred to parallel operation in duplicate units, even though the single unit operation requires additional feed and product storage — however, total investment and labor costs are minimized. Table 4 summarizes an economic comparison of three different equipment arrangements for a catalytic cracking unit, including the primary fractionation facilities.

The three cases have identical calendar day feed and product rates. Case I is a single unit with an integral fractionator. Case II includes two identical cracking units each having its own fractionator but with a common control house and operating crew. Each unit is designed for one-half of the total feed rate. Case III includes two identical cracking sections with a common fractionator and a common control house and operating crew. Each cracking section is designed for one-half of the total feed rate.

Table 4 shows considerably lower operating costs and slightly lower investment cost for a single unit even though considerably more tankage is required.

An exception to the generalization that a single unit is cheaper than duplicate smaller sized units results where the quality of feed processed or the products required vary widely. In some cases lube treating unit solvent rates may vary widely for the production of different quality lubes. Classifying the operations according to high and low treat operations, it is possible in some cases to design a unit, with two treating and raffinate recovery sections and with a common extract solvent recovery section, for lower investment and operating costs than for a unit with single treating and raffinate recovery sections. In this case, increased flexibility is obtained with less tankage and a lower total cost.

4—Range of Operating Conditions

A range of process variables should be considered in the design of any specific process unit. The advantages of flexibility in operating conditions must be balanced against the cost of this flexibility. The Fluid catalytic cracking unit provides a good example of a unit for which a careful study of operating conditions is necessary before the final design. Table 5 illustrates the effect of varying process conditions on costs and yields.

Assume that the optimum reactor pressure has been set. Consider the variable of reactor temperature, for which two cases at 900 and 950° F. are investigated. Flexibility in this example shows little advantage. A unit which can operate at either temperature requires a 12% capital investment increase and a 5% operating cost increase, with only a 1% product credit for the best case.

Although the 950° F. reactor case shows an 8% return on the incremental investment over the base case, a flexible unit which can run at either temperature shows only about a 2% return on the incremental investment when making the optimum product distribution.

To set the process conditions for almost every refinery process unit, economic studies such as in Table 5 are a necessity.

Built-in Flexibility is advantageous in process units since feed stocks constantly change, and optimum process conditions vary between stocks. Flexibility should be incorporated into

* This case has been taken from a recent publication, "The Growth of Integrated Oil Companies" by J. G. McLean and R. W. Haigh, published by the Harvard University Graduate School of Business Administration, Chapter 20, page 571.

Table 3—Refinery flexibility, conventional versus combination unit

Type of unit	Conventional, incl. vacuum dist., visbreaking & polymerization	Catalytic combination unit
Capacity, b/cd	25,000	25,000
Investment, millions $	24.5	16.0
Product yields, liquid volume %		
Gasoline	48.0	45.0
Kerosine	10.0	10.0
Gas Oil	23.0	15.0
Fuel Oil	18.0	29.0
Salable product credit, $/bbl.	4.20	3.99
Operating cost, $/bbl.	0.88	0.62

Table 4—Single versus multiple units, catalytic cracking units

	Case I Single unit	Case II 2 independent units	Case III 2 cracking units, 1 fractionator
Service factor, %	89.9	91.7	90.4
Turnaround time, days	24	21	21
Unit investment cost, millions $	7.10	9.13	8.57
Tankage investment cost, millions $	2.26	1.04	1.52
Total investment cost, millions $	9.36	10.17	10.09
Total operating cost, $/day	6,650	8,170	7,630

the process design if it can be justified economically.

Service Factor and Maintenance Flexibility

It is necessary to provide equipment beyond the normal process requirements for cleaning and repairs on certain types of equipment and maintenance work.

Special materials may be desirable to insure against equipment failure during upset periods when process characteristics deviate from the normal. The extent of these extra facilities is determined by the cost for providing the equipment flexibility versus losses resulting if operations are interrupted due to equipment failure or a reduction in equipment efficiency.

Spare pumps for critical services are common practice where a failure would cause a plant shutdown or loss of a valuable product. Spares are also provided for critical instruments without which control of the process is difficult or impossible. Spare exchangers may be provided where a serious fouling problem exists requiring frequent cleaning.

It is better to provide spares for individual equipment items in the above categories where the continuous service life of the equipment is appreciably less than the run length of the unit as a whole. Provision of spare equipment involves the addition of bypass lines and block valves to remove the individual equipment items from service without interruption of the process.

Table 6 summarizes a cost study justifying a spare compressor in a low pressure cracking unit. Gas engine driven compressors are preferred over centrifugal units for this size of plant.** Three gas engine driven units are selected for normal operations.

** Based on previous experience.

To minimize maintenance expense, it may be desirable to modify equipment design from the process optimum. For example, the spacing between the convection tubes in a furnace may be determined by the requirements for cleaning during the shutdown rather than by heat transfer considerations. This lower heat transfer efficiency may result in increased furnace cost. However, it can be justified by easier maintenance in refineries where the flue gases have a high solids content resulting in severe tube fouling.

The above cases are intended to illustrate some methods of thinking and ways of solving problems encountered in refinery design. The conclusions here cannot be generalized as a solution for all similar problems, but indicate some of the factors each designer should consider to obtain optimum refinery flexibility.

Table 5—Flexibility investment return, Fluid Catalytic Cracking unit

Reactor temperature, °F.	900	950	900 and 950
Process investment, millions $	6.38	6.76	6.92
Incremental process invest., millions $	—	0.38	0.54
Incremental other invest., millions $	—	0.16	0.23
Total incremental invest., millions $	—	0.54	0.77
Incremental product credits, $/calendar day	—	331	331
Incremental operating cost, $/calendar day	—	209	292
Incremental profit, $/calendar day	—	122	39
Incremental profit, $/year	—	44,500	14,350
% return on incremental invest.	—	8.2	2.0

Table6 - JUSTIFYING SPARE COMPRESSOR FOR CRACKER
(Incremental advantage of 4 over 3 gas engine driven compressors)

1. Incremental value of products: 6.52¢/lb
2. Loss of product if one Compressor (out of three) comes down: 3460 lb/hr.
3. Design service factor for entire plant: 82%
4. Design service factor for compressor (during plant onstream period): 95.5%
5. Loss per year due to Compressor down time if no spare is available: 3460 x 364 x 24 x 3 x 0.82 x 0.045 = 3,360,000 lb/yr.
   3,360,000 x 0.0652 = $219,000/yr.
6. Differential Compressor cost, four units versus three: $150,000
7. Differential operating costs, four units versus three: $16,800/yr.
8. Return on investment for spare Compressor:
   ($219,000 − $16,800) / $150,000 = 135%

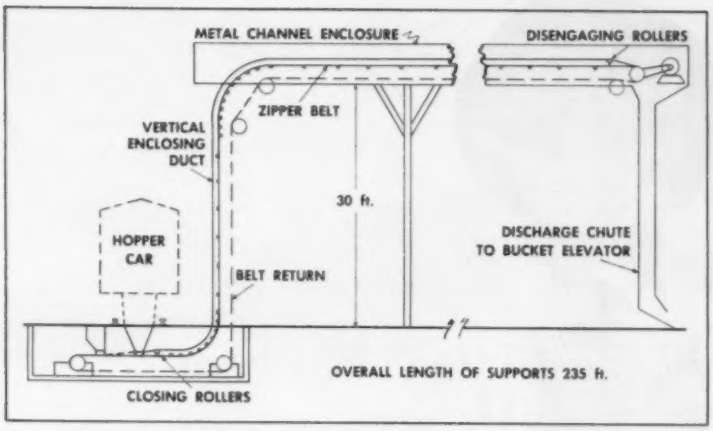
Mr. Packie

Mr. Campbell

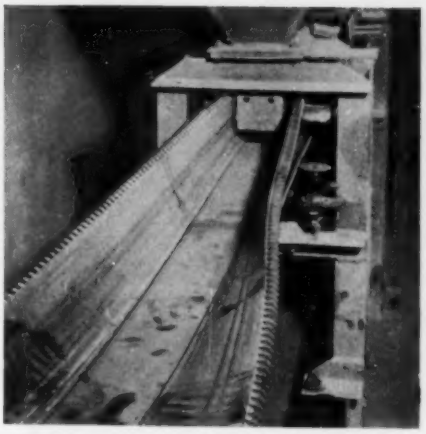
Meet the Authors

John W. Packie has been with the Standard Oil Development Co. since 1929 when he graduated from Stevens Institute of Technology in mechanical engineering. He is now chief design engineer, Esso engineering dept. A member of the American Chemical Society, he holds numerous patents and has co-authored papers on distillation, treating, and fluid catalytic cracking.

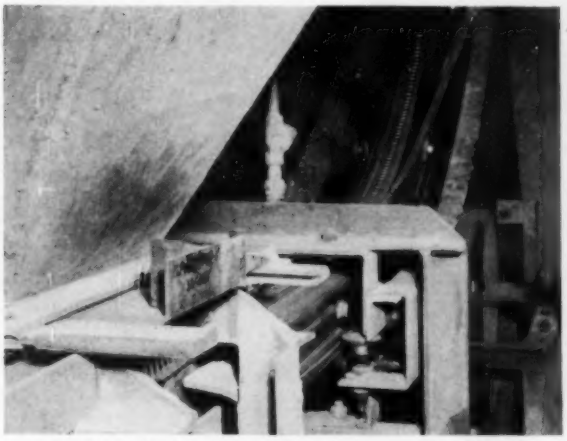
Donald L. Campbell, with S.O.D. since 1928, is chief process engineer of the Esso engineering dept. He received a B.S. in chemical engineering at Iowa State and an M.S. in chemical engineering practice at M.I.T. He has been actively connected with the design of large refineries for S.O.D. affiliates and the development of synthetic rubber and aviation gasoline. He holds several patents in the fluid solids technique as applied to catalytic cracking and in the manufacture of synthetic fuels.



CONTINUOUS catalyst conveyor system



BELT IS CUPPED at car unloading chute



LOADED AND ZIPPED belt starting up vertical shaft

HOPPER-CAR and conveyor system shaft

'Zipper' Catalyst Conveyor Climbs Obstacles

A "ZIPPER" belt conveyor solved the problem of moving bead catalyst to storage at Continental Oil Co.'s Lake Charles, La., refinery.

The distance from the railroad hopper cars to the catalyst storage bins for two newly (1952) installed thermal catalytic crackers was 250 ft., blocked at ground level by intervening buildings. Foundations and pipe lines blocked an underground route.

After investigation, Continental decided to use an overhead conveyor route with the continuous zipper belt which holds its load firmly by "zipping" together at the top. By this method a single unit is capable of making a vertical rise followed by a long horizontal run. The 4 in. wide 527 ft. long continuous belt travels 106 ft./min. and will move 10 ton/hr. with a 5 hp. chain drive motor.

To operate, the catalyst hopper car is positioned over the unloading chute, and the slide gate manipulated to discharge catalyst onto the belt, which has been cupped by rollers to receive the catalyst. After being loaded, the zipper teeth of the belt are meshed to form a closed container. Rising vertically 35 ft. to overcome intervening obstacles, the belt system then extends horizontally for about 235 ft. At the discharge end the zipper is opened and catalyst dropped into a chute to be picked up by a bucket elevator and moved to a storage bin.

Costs for unloading one hopper car (43 tons) of catalyst—not including the initial investment and maintenance costs—are $14.10 for labor (6 hours) and $0.10 for utilities.

The belt will automatically shut-off if it unzips, or if the catalyst level at the belt discharge chute should build up.

Additional advantages of the zipper belt conveyor include rapid unloading, no spillage, no breakage, low labor costs, and simple operation and maintenance.

THERE'S NO MAGIC ABOUT IT

DON'T BE SURPRISED, the next time you're traveling through Lebanon, if you see a sign at a refinery which reads, "Built by Procon." You may run across one on a chemical plant in England. You'll find them in Australia, Canada, Germany, Belgium, the Canary Islands, and in 18 of the 48 United States.

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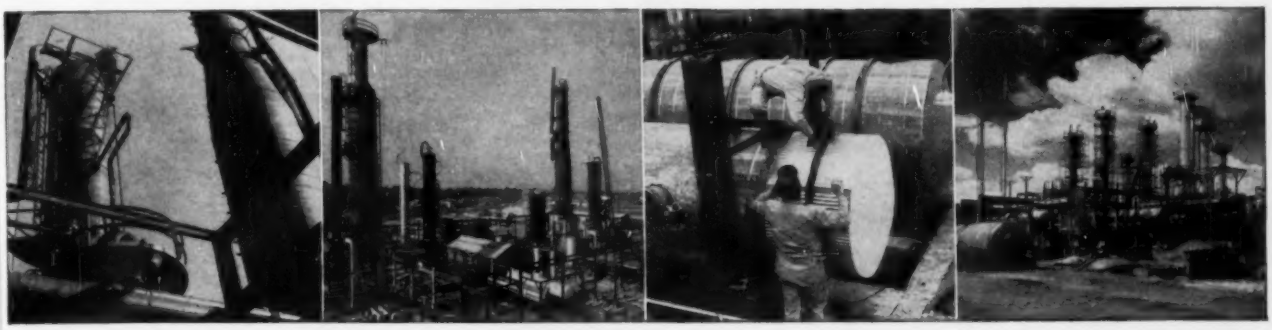
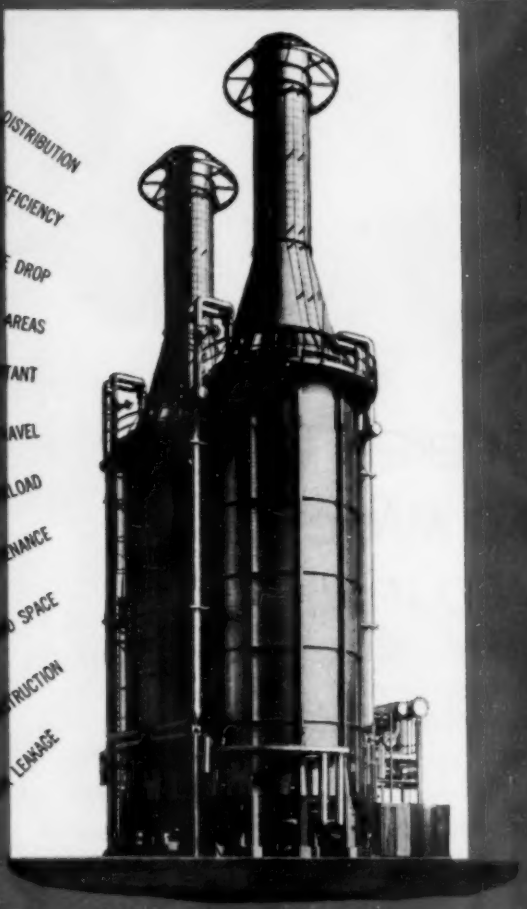


If yours is a fluid heating problem



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PETROLEUM PROCESSING

DECEMBER 1954

Petrochemical Processing Section

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For a Safer Plant

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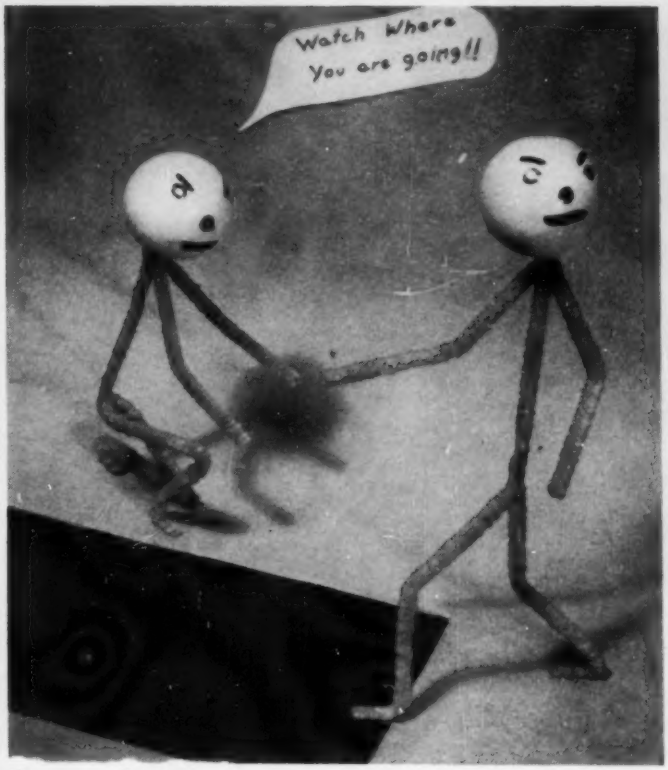

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In the Departments

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North, east, south and west . . . Hortonspheroids® have *proved* their efficiency to reduce evaporation loss of volatile liquids throughout the country. The 100,000-bbl. Noded Hortonspheroids above are in natural gasoline service at Warren Petroleum Company's Northworthy Terminal, Houston, Texas. 141-ft. 6-in. in diam., these Hortonspheroids were designed for a working pressure of 15 lbs. per sq. in.

Hortonspheroids are built in standard capacities to 120,000-bbls. and in the smaller capacities for pressures up to 100 lbs. per sq. in. When planning storage facilities for volatile hydrocarbons be sure to write our nearest office. Chicago Bridge & Iron Company engineers will be happy to recommend installations best suited to your operation . . . at no obligation to you.

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HEAVY PLANT CONCENTRATION is emphasized in this regional map (numeral after town name shows number of plants)

Gulf Coast Petrochemicals at Peak?

PETROCHEMICALS and the Gulf Coast—virtually synonymous. It has been estimated that 75% of the petrochemical production of the United States today is located in that region.

But will this "heart of the industry" continue to share in the future growth nation-wide? Will it keep pace, will it jump ahead, or will it drop behind? How has it been doing lately?

In the recent past, for example the year ending Aug. 1, 41 new petrochemical plants went into the planning or building stage throughout the United States. These new facilities represented an estimated investment of nearly $555,000,000.[1] The Gulf Coast's share of these totals ran to about 13 plants (approximately 31%), and an estimated $220,000,000 (approximately 40%). These are "ball-park" figures, since investment costs have not been disclosed in all cases.

For the future, chances are the pace will hold. Any possibilities for a gain—or, conversely, for a lag—center on the big "IF's" of labor, taxation, and other political factors. Beyond this generality, a more specific prediction is very difficult. However, opinions based on general trends are possible, according to a recent report by Henry Groppe of Monsanto Chemical Co. For example:

On the plus side—factors which can be expected to increase the dominance of the Gulf Coast in petrochemicals—are: increasing use of low cost water transportation, further integration of existing manufacturing operations, and the tendency for rapid growth to be self-generating.

On the minus side—factors which will lower the region's dominance—are: increasing fuel and raw materials costs, decentralization on the part of some manufacturers, increasing water shortages, and a growth of refining centers elsewhere—closer to marketing areas.

Numerically, there are more minus factors; however, not all of them exert the same amount of effect on the Gulf Coast potentialities. Nevertheless, they must all be considered in at least some detail in an evaluation of the future of the region.

Water Transportation . . . *A Plus*

A most important development in the transportation of petrochemical products has been the increasing movement of these materials to markets by barge and tanker.[2] Transportation of chemicals by water from producing plants on the Gulf Coast to strategic points nearer to market areas for subsequent storage, handling, and distribution has in many cases shown savings over direct transportation by rail or truck, Mr. Groppe points out.

The advantage of water rates is indicated in the comparison shown in Table 1. It should be pointed out that the costs shown in this comparison table do not include insurance, terminalling, or storage costs. Neither do they reflect increased working capital requirements because of the large quantities of material in storage and in transit required to

accommodate large minimum-load, slow-moving water transportation.

Big-Scale Economics . . . A Plus

One of the characteristics of the petrochemical industry is the use of large-scale, highly automatic, continuous processes. In processes of this nature, unit production costs generally decrease significantly as plant capacity increases. This is usually effective throughout a fairly wide range of plant capacities.

This factor has favored the installation of large-scale raw material oriented petrochemical plants in the Gulf Coast from which all markets are served. This large scale operation also accommodates use of low cost water and pipeline transportation.

One of the most outstanding examples of this is Gulf Oil Corp.'s ethylene manufacturing operation at Port Arthur.[3] It is probable that other operations of this nature and scale will provide further growth.

On the other hand, it is possible that the importance of the economics of scale in stimulating Gulf Coast petrochemical industry will diminish to some extent as area demands for given products reach sufficient volume to justify economically sized plants located in given market areas.

Integration . . . A Plus

Further integration of existing manufacturing operations in the Gulf Coast area is a very important factor in future growth. Most of the growth so far has been with the very basic chemicals—the big volume items like ethylene.

However, as the industry matures there can be, and likely will be, an increasing vertical integration or upgrading of these basic materials to higher value products. And the existing operations provide a broad, firm foundation for this growth.

Self Generation . . . A Plus

The tremendous expansion in the southwest has created favorable psychological conditions stimulating investment in the area. This has often been described as the self generating characteristic of rapid growth.

The success that some enterprises have had gives other enterprises confidence in risking capital in the area. Service facilities such as machine shops and fabricators have been established to meet the needs of the area. Likewise, community and public facilities have been developed to meet the needs of a rapidly growing population. The increase in population accompanying the industrial growth in turn stimulates further growth.

Pipeline Transport . . . A Minus

Two developments in the transportation of petrochemical raw materials will tend to retard growth in the Gulf Coast area because they provide lower cost raw materials closer to the ultimate chemical markets.

One of these is the growth of the long distance gas transmission industry, which affords the opportunity for large scale processing for the recovery of ethane and the heavier hydrocarbons remaining in the gas at or near the market end of the pipe line.[4]

Because of the large scale of such operations, the contained ethane and heavier hydrocarbons are transported relatively cheaply. Operations of this type are being carried out at Tennessee Gas Transmission Co.'s pipeline in Kentucky and on the Panhandle Eastern Pipeline Co.'s system in Illinois.

The second development is the increasing transportation of propane and butane as liquefied petroleum gases in crude or products pipeline systems, which would also provide lower cost raw material for petrochemical manufacturing operations nearer consuming centers.

In the past, these materials were transported primarily by rail. However, Phillips Petroleum Co. is now transporting LPG from producing areas to Chicago in its products pipeline system. The proposed American Pipeline Co. line for large scale transportation of refined products from the southwest to the east is reportedly designed for transportation of LPG as well as other products.

Raw Materials & Fuel . . . A Minus

The most important single factor up to now in the rapid growth of the Gulf Coast petrochemical industry has been the abundance of relatively cheap raw materials and fuel in the form of petroleum and natural gas hydrocarbons.

However, the most significant recent trend in this field has been the rapid increase in the price of natural gas. The estimated average for industrial gas prices on the Gulf Coast has risen from 10¢/MM Btu in 1950 to about 15¢ in 1954.

The many advantages of natural gas as fuel has led to the continuous high rate of expansion of the long distance pipelines from the southwest to the large fuel markets of the north and east. As a result of this competition for gas supplies, new contracts provide for starting well-head prices as high as 20¢/MCF.

The impact of rising gas prices has been graphically illustrated by the recent establishment of a large electrochemical operation in central Texas based on power generation from lignite. Aluminum Co. of America is building a plant at Rockdale, Tex., in Milam county. The location was selected because of nearby large deposits of the lignite.[5]

It is difficult to estimate the limit to the possible rise in the price of gas. Some authorities have estimated that approximately 20¢/MCF is the maximum price that can be paid for it at the well-head for transmission to the northeastern markets in competition with other fuels. One possible limiting factor is the cost of manufacturing high Btu gas on a large scale from the large supplies of coal in the northeast.

This increase in the price of natural gas will also be reflected to some extent in the prices of ethane and other hydrocarbon raw materials recovered from this source.

One of the characteristics of the chemical industry is its high degree of flexibility. This implies continuing competition between raw materials, processes, and products. This is particularly true in the case of raw materials. There are few of the thousands of chemicals produced by the industry that cannot be made from alternate raw materials. In the case of the hydrocarbon chemicals there is constant competition between natural products, coal, and petroleum raw materials.

In the petrochemical field, the raw material flexibility and the resulting competition are reflected in several ways. The production of carbon black, where the cost of raw materials is very significant, is being converted rapidly from natural gas to petroleum fractions.

In the case of ammonia manufacture, there are preliminary indications of a change in the trend from coal to natural gas. Two plants being built are to use residual fuel oil, and it is reported that other new plants are designed for later conversion from natural gas to oil. This trend has little direct effect on the Gulf Coast petrochemical industry, however, since ammonia plants generally are oriented with respect to the market.

Another reflection of rising light hydrocarbon raw material costs is the increasing interest in heavier hydrocarbons as raw materials for ethylene production. For example, Allied

Chemical & Dye Corp. recently began making ethylene from residual fuel oil at their Tonawanda, N. Y., plant. Of definite long-range interest is still another factor—the work being done in the field of coal hydrogenation.

Refining Elsewhere . . . A Minus

Coupled to a large extent with the overall raw material factor is the development and growth of the petroleum refining industry near its ultimate consumer markets and the increasing importation of foreign crude oil. On the East Coast, for example, there was a 96% increase in refining runs during the 10-year period from 1943 to 1953. Since refinery gases constitute a prime petrochemical raw material, increased future attention will undoubtedly focus on growing refining centers such as this. And with the increase in imports of relatively cheap foreign crude oil, the East provides a location combining cheap basic raw materials and proximity to ultimate markets.

Water Supply . . . A Minus

Though a problem common to many sections of the country today, an adequate supply of good quality water is becoming increasingly difficult, particularly in the lower Gulf area and more highly industrialized sections.

Rainfall in the Gulf region varies from about 50 in./yr. in Louisiana to 15 in. in the Brownsville, Texas, area. There are extensive underground water supplies in some sections, but these are rapidly diminishing in many cases. However, irregular rainfall and steadily mounting water demands limit the supply available for further expansion. Competitive demands for water, particularly for use in irrigation, are steadily rising too.

Surface storage is being expanded in some cases. A long range program of integrated river storage and interlinking canals was proposed recently for the entire Texas Gulf Coast. Increasing attention must be given to this problem.

Decentralization . . . A Minus

In one sense, the development of the Gulf Coast petrochemical industry was part of the trend on the part of many large corporations to decentralize their expanding operations. During the war some companies were encouraged or required by the government to decentralize for defense production security reasons, while others have followed such a policy for purely economic reasons.

Now, however, a point has been reached of high regional concentration of the petrochemical industry on the Gulf Coast, and some decentralization away from this area may be dictated from the standpoint of national defense.

Table 1—Estimated Transportation Rates

(in $ per 100 lb.)

	Rail	Truck	Barge
Caustic, bulk Houston to St. Louis	0.76	0.76	0.47
Ethylene glycol Houston to Chicago	1.20	—	0.30
Ethylene glycol Houston to New York	1.27	—	0.35*

* By tanker instead of barge.

Labor and Taxes . . . the "IF's"

An adequate supply of skilled labor has grown up with the expansion of the petrochemical industry in the Gulf region. From a long range viewpoint, however, the labor supply may become short since most of this industry now is raw material oriented, supplying distant consumer markets which, of course, represent the major labor sources.

Taxation is another important factor. As the various advantages the Gulf Coast enjoys over other areas decrease, tax structures and other political factors—such as zoning policies and regulatory actions—will become increasingly important in determining the extent of further growth.

References

NOTE: the major portion of the preceding article has been taken from "General Petrochemical Outlook for the Gulf Coast," by Henry Groppe, development engineer, Monsanto Chemical Co., Texas City, Texas, a paper presented at the 9th annual technical meeting, South Texas section, American Institute of Chemical Engineers, Oct. 22, Galveston. Other references include:

(1) "New 1954 Petrochemical Survey, PETROLEUM PROCESSING, Sept., 1954, pp. 1417-1432h.

(2) "Petrochemicals Go to Sea in Style," PETROLEUM PROCESSING, June, 1954, pp. 907-909.

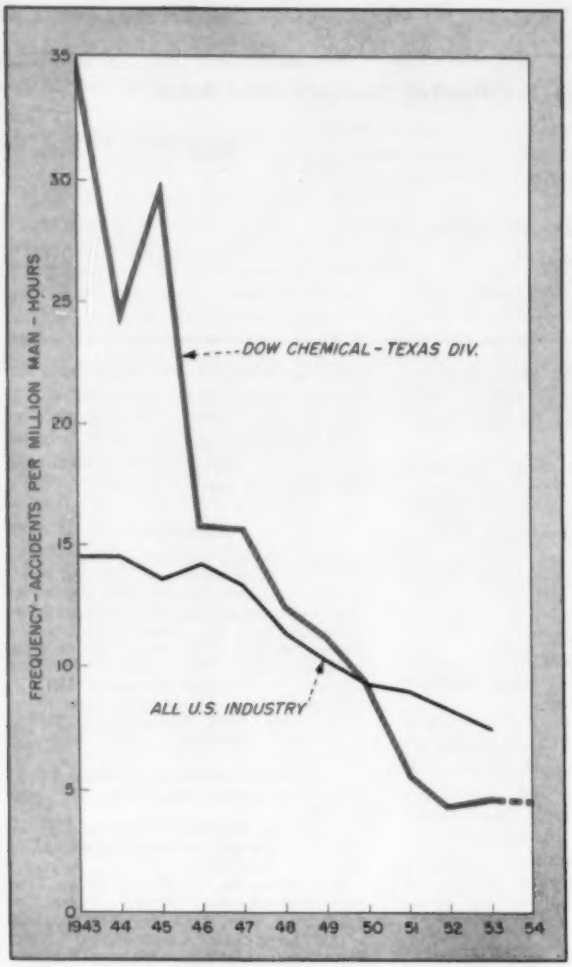
(3) "Eight Problems in Ethylene Manufacture," PETROLEUM PROCESSING, July, 1954, pp. 1076-1080.

(4) "Where Do You Plan to Locate Your New Petrochemical Plant," PETROLEUM PROCESSING, May, 1952, pp. 571-572.

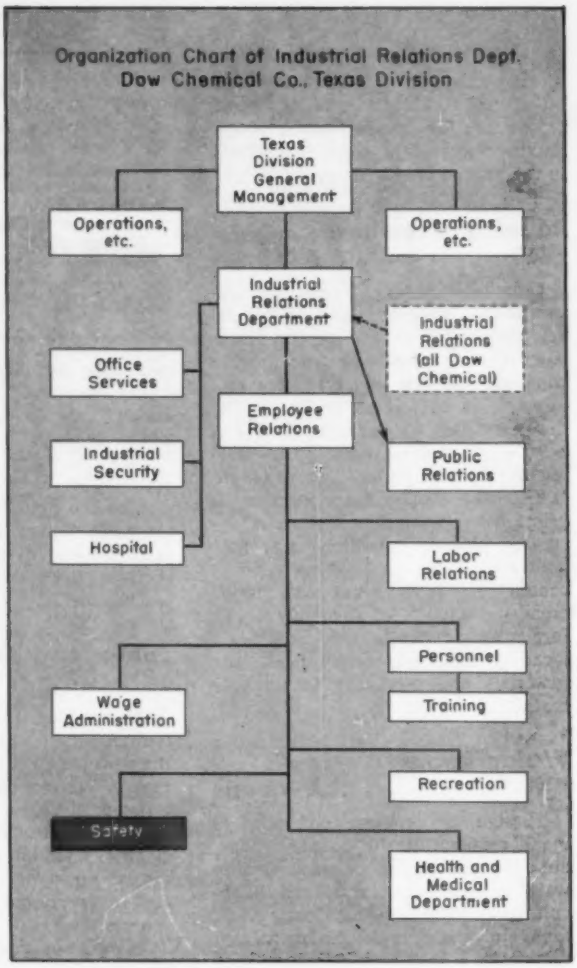
(5) "Large-Scale Lignite-Fueled Power Plant Soon Goes into Operation," PETROLEUM PROCESSING, Dec., 1952, p. 1707.

NEWS in VIEWS

FIRST BAGS OF FERTILIZER from Lion Oil Co.'s new $31,000,000 plant at Luling, La., are these bags of ammonium nitrate. Officials looking on include (left to right): R. L. Van Zandt, plant superintendent; J. M. Elsas and L. J. Even, of Fulton Bag & Cotton Mills, whose products are used in the packaging; and W. G. East, Lion's purchasing agent at Luling.



A STEADY IMPROVEMENT through eleven years, Dow's Texas Division record has bettered the national averages



SAFETY IS STRICTLY A STAFF FUNCTION for Dow, just one part of its industrial relations department

Want a Record Like This?

Make Every Man a Safety Man

A COMPLETELY decentralized safety program features the efforts of Dow Chemical Co.'s Texas Division to bring industrial injuries to the lowest possible accident frequency.

Everybody gets into the act, from top brass to lowest echelon. There are no "sermons," unwieldy general safety meetings of questionable value and complicated paper work where potentially hazardous jobs must be done. The idea is emphasized that safety cannot be separated from operations; the two are like ham and eggs.

Accident frequency this year will range between 4.5 to 5 lost-time injuries per million man-hours for the Texas Division, at an employment level of approximately 5600 people. The all-time low was 4.2, achieved in

By DAVID P. THORNTON, Jr.
Southwestern Editor

1952 at an employment level exceeding 6000. The all-time high was 34.9 back in 1943, marking the third year of the Division's existence—data for prior years, 1941 and 1942, are not reliable. The record by years is shown in the above chart and in Table 1.

Two departures from the ordinary are in Dow's Texas Division safety program.

One is that the safety department promulgates no safety rules or regulations. It is a small department, has no "police power" to enforce safety rules; rarely sponsors safety meetings; cannot issue "safe work permits," and has no direct responsibility for preventing injuries. All of these duties except preparing rules are the responsibility of the individual departmental supervisor. Rules are issued through plant top management only.

The safety department is strictly a staff organization except that it does provide safety equipment to personnel through its stockrooms. The medical department, its hospital and first-aid stations are entirely separate from safety. It may, like the safety department, suggest safety rules, but it does not make or enforce them. However it can and does prescribe to supervisor and supervised alike how an injury shall be treated in the field.

The organization chart shown here makes this division of authority and function somewhat more clear. Em-

ployee relations, public relations, industrial security, hospital, and office services are all part of the industrial relations dept. Industrial relations reports to the division general manager as do operating and other special groups of the division.

The second unconventional approach is in the variety of ways the individual departmental supervisors in the company prepare their own safety program, custom tailored to special needs and reflecting the men's own ideas on the subject. They borrow from one another, experiment and modify.

This does not mean that supervisors are entirely autonomous in teaching and enforcing safety, as the limits of their authority are set by the division-wide Executive Safety Council under the chairmanship of the division's general manager. But they do have wide latitude to use individual initiative in tailoring the program to suit their needs. They can and usually do call on the safety department to help prepare their individual programs, provide literature, visual aids and make suggestions.

The safety department itself consists of six "safety supervisors," the department head, and secretarial help. The two manufacturing plants, seven miles apart, and associated field installations which comprise the Division's activities are divided into six areas, three in "Plant A" and the remainder at "Plant B."

At Plant A; one supervisor looks after the safety needs of the shops, power plant, gas and water and such miscellaneous groups as the cafeteria. A second supervisor deals with outside contractors, Dow's construction department, the chlorine cells, tank car cleaning, motor transport and the garage. A third has the responsibility of the organic manufacturing area, all inorganic production except the chlorine cells, and the central laboratory. Plant B is similarly split.

The safety supervisor works with the operating supervisors in his individual area. He helps department supervisors plan their individual safety programs, meetings, and is there to advise on safety problems. He keeps their safety and accident records. He makes all flammable gas tests except for the few special departments which have their own equipment.

A major responsibility of the safety supervisor is personal contact work with and "selling safety" to the supervisors in his area. While he never makes formal "safety inspections" at any time, he does keep his eyes peeled for trouble which he reports to the supervisor.

Occasionally he conducts a safety meeting for an operations supervisor, generally when the subject is of specialized nature as in first aid training, but usually he is present merely as an observer or an assistant. When he sees something of general interest at a safety meeting he may pass this along to other supervisors but he does not report on the meeting or the supervisor's program as a management "stool-pigeon."

Another important responsibility is to investigate accidents. If possible he will make an "accident run" with the ambulance, but the injured are taken care of as expeditiously as possible whether the safety supervisor is present or not. His report of the accident investigation is made to the affected supervisor and forms a part of that supervisor's own investigation.

Heart of the safety program is the Executive Safety Council, a 30-man group of top executives headed by the division general manager. This group meets monthly to review the division's safety program and its problems. It is an effective way of getting top management in a safety meeting once a month.

This group's first order of business is to review considerably detailed reports of a three-man accident review committee which cover all lost time and potentially serious injuries which occurred in the preceding 30-day period. It is not uncommon for the committee to call in plant superintendents for more detailed information or recommendations in special cases.

Always on the agenda is the status of the overall safety program and consideration of any recommendations. All general safety rules are issued by this committee. Specific recommendations may be made for division-wide problems.

A case in point is the standardization of eye-wash baths in appropriate areas and an order that washing must be continued for not less than 15 minutes immediately following eye injuries caused by any chemical.

One of the most frequent contributors to the high early accident frequency rate had been eye injuries (see Table 1), such as getting chemicals into the eye from drips, spills, or as dusts. Experience proved, however, that lost-time injuries from this cause —since goggles are not the perfect preventive — could be almost completely eliminated by immediately flushing the eye with water and continuing for not less than 15 minutes. Washing is continued even in the ambulance while the patient is being taken to the hospital for treatment.

Today there are plenty of eye baths of Dow design located in areas where this hazard may exist. Showers abound also. Washing time must be determined by the clock, not by guesswork. In 1953 there were only four injuries from this cause, and four to date in 1954.

In addition to the executive safety council, there is an area accident review committee in each unit plant area which also meets monthly. Having a rotating membership of supervisors from within the area, these committees meet separately to discuss and evaluate all the accidents which occurred in their areas. Another important job is the making of general safety inspections, although the individual area supervisors also make their own inspections.

The chairmen of the area committees in turn meet with a three-man group from the Executive Safety Council, called the Accident Review Committee. Here the area accident reports are presented and it is decided which

Table 1—Dow's Texas Division Accident Frequency vs. U.S. Incidence

(Frequency rate in lost-time accidents per million man-hours.)

	Dow Chemical, Texas Div.				All U.S. Industry	Chemical Industry
Year	Freq.	No. of employes avg.	No. of lost-time accidents	No. of lost-time eye inj.	Freq.*	Freq.*
1954**	4.5-5.0	5656	42	4	—	—
1953	4.6	6024	56	4	7.44	4.5
1952	4.2	5636	49	2	8.4	5.1
1951	6.6	4745	67	14	9.06	—
1950	9.3	3347	66	4	9.3	—
1949	11.2	3057	72	21	10.1	—
1948	12.3	3156	82	—	11.4	—
1947	16.6	3207	112	—	13.3	—
1946	16.7	2417	81	—	14.2	—
1945	28.9	2056	141	—	13.6	—
1944	24.8	2140	125	—	14.5	—
1943	34.9	—	—	—	14.5	—

* From National Safety Council, "Accident Facts, 1954."
** Dow figures are for first nine months of 1954.

THE DOW CHEMICAL COMPANY
TEXAS DIVISION

SAFE WORK PERMIT

TO: _____ DEPT: _____ DATE: _____

FROM: TIME _____ AM PM TO: TIME _____ AM PM

VALID FOR AREA _____ SPECIFIC LOCATION _____

CHECK #2, 3, 4, 5, 7, 8 OF AREA PERMIT ON ALL JOBS

1 AREA PERMIT ONLY

1. DESCRIBE WORK TO BE DONE _____
2. IS IT PRACTICAL TO MOVE THIS EQUIPMENT TO ANOTHER AREA? YES ☐ NO ☐
3. IS ADJACENT AREA AND EQUIPMENT SAFE? YES ☐ NO ☐
4. IS COMBUSTIBLE GAS TEST NECESSARY? YES ☐ NO ☐
   RESULTS _____ TIME _____
5. HAVE ADEQUATE FIRE PRECAUTIONS BEEN TAKEN? YES ☐ NO ☐
6. SPECIAL PRECAUTIONS, TOOLS AND SAFETY EQUIPMENT NEEDED _____
7. INSPECTED BY _____
8. CIRCLE NO. OF OTHER PERMITS NECESSARY 2 3 4

2 PIPE WORK PERMIT

1. DESCRIBE WORK TO BE DONE _____
2. SERVICE OR CONTENTS OF LINE _____ YES NO
3. HAS PIPE BEEN CLEANED? ☐ ☐
   HOW? _____
4. HAVE ALL CONNECTIONS BEEN BLANKED OFF? ☐ ☐
   BLINDED ☐ VALVED ☐ DISCONNECTED ☐
5. HAVE RED TAGS BEEN ATTACHED? ☐ ☐
6. IS COMBUSTIBLE GAS TEST NECESSARY? ☐ ☐
   RESULTS _____ TIME _____
7. SHOULD THIS EQUIPMENT BE PURGED WHILE WORK IS BEING PERFORMED? ☐ ☐
   AIR ☐ STEAM ☐ OTHER _____
8. SPECIAL PRECAUTIONS, TOOLS AND SAFETY EQUIPMENT NEEDED _____

3 PERMIT FOR MACHINERY

1. DESCRIBE WORK TO BE DONE _____
2. SERVICE MACHINERY HAS BEEN IN _____ YES NO
3. HAS MACHINERY BEEN CLEANED? ☐ ☐
   HOW? _____
4. HAVE ALL CONNECTIONS BEEN BLANKED OFF? ☐ ☐
   BLINDED ☐ VALVED ☐ DISCONNECTED ☐
5. HAVE RED TAGS BEEN ATTACHED? ☐ ☐
6. IS COMBUSTIBLE GAS TEST NECESSARY? ☐ ☐
   RESULTS _____ TIME _____
7. HAVE FUSES BEEN REMOVED? ☐ ☐
8. HAVE SWITCHES BEEN OPENED? ☐ ☐
   BY WHOM? _____
9. SHOULD THIS EQUIPMENT BE PURGED WHILE WORK IS BEING PERFORMED? ☐ ☐
   AIR ☐ STEAM ☐ OTHER _____
10. SPECIAL PRECAUTIONS, TOOLS AND SAFETY EQUIPMENT NEEDED _____

4 VESSEL WORK PERMIT

1. DESCRIBE WORK TO BE DONE AND TYPE VESSEL _____
2. WHAT HAS VESSEL CONTAINED? _____ YES NO
3. HAS VESSEL BEEN CLEANED? ☐ ☐
   HOW? _____
4. HAVE ALL CONNECTIONS BEEN BLANKED OFF? ☐ ☐
   BLINDED ☐ VALVED ☐ DISCONNECTED ☐
5. HAVE RED TAGS BEEN ATTACHED? ☐ ☐
6. IS COMBUSTIBLE GAS TEST NECESSARY? ☐ ☐
   RESULTS _____ TIME _____
7. IS AN OXYGEN TEST NECESSARY? ☐ ☐
   RESULTS _____
8. SHOULD THIS EQUIPMENT BE PURGED WHILE WORK IS BEING PERFORMED? ☐ ☐
   AIR ☐ STEAM ☐ OTHER _____
9. SPECIAL PRECAUTIONS, TOOLS AND SAFETY EQUIPMENT NEEDED _____

IS IT SAFE TO DO THIS WORK? ☐ YES ☐ NO

APPROVED & ISSUED BY: _____ APPROVED & RECEIVED BY: _____

ORIGINAL TO ISSUING DEPARTMENT UPON COMPLETION OF WORK
COPY RETAINED BY PERSON ISSUING PERMIT

NO. _____

SAFE WORK PERMITS are relatively conventional in form, but at Dow they are issued by supervisors instead of by safety department

pertinent accidents should be discussed in the Executive Safety Council meeting, which follows shortly. Various safety suggestions and recommendations from the different areas also are discussed, from which action is either taken by the review committee or the matter referred to the council along with the report of the review committee.

Key men in the safety program are the supervisors themselves. They have the responsibility for enforcing safety rules, initiating action against hazards, issuing "safe work permits" and, last but not least, selling safety to their men. It is here that safety is indistinguishably intermixed with operations. Plant-wide safety contests, bulletin notices, safety posters and the like are their tools. But the attitude of these men, the way they go about using their tools and developing their own ideas decides whether the program flops or succeeds. They go at it in various ways.

One supervisor, for instance, believes that the "personal touch" is best and holds but few safety meetings among his men. He sees each man on a systematized basis at least once a month. They will talk about safety on the man's job, whether or not a hazard can be minimized, the use of personal protective clothing and area or team standing in the latest safety contest, for example. If a man is frequently injured, the supervisor—often with help from the safety supervisor, tries to find the cause. Perhaps a transfer or restricted activity is the answer.

Another supervisor is currently making use of a modified "spelling bee" to familiarize his men with recently revised general safety rules. No attempt is made to embarass personnel if they get spelled down; the discussion in giving the correct answers gets the desired points over.

Still others use a multiple-choice, or true-false, quiz for the same purpose. Papers do not identify the individual but the paper is graded. Questions are designed to make the man think without tricking him; it is hoped that everyone will make "100%."

An inspection group is required in each operating department. Although how it is organized is left in the hands of the supervisor, usually it consists of the supervisor himself with a representative from each group under him —such as an operator and several craftsmen. Usually this is a rotating membership. The group inspects the particular unit plant once a month and reports findings and suggestions. This is posted on the individual plant's bulletin board. Beside or with the suggestion in the report is placed the answer to it and, if necessary, a progress report on what is being done.

"Safe work permits" are issued by supervisors for the area affected, or by delegation of this authority, and the procedure is designed for a minimum of pencil pushing. The permit is divided into four parts, or blocks, as shown in the illustration. Block 1 must always be completed, the others only when they apply.

There is some argument that the answers to certain questions are rather obvious. Questions No. 2 and 5 in Block 1, for example, ask if it is practical to remove the equipment from the area and if adequate fire precautions have been taken. The argument is that the equipment would be removed if practical, and "yes" is always the answer to the fire protection question.

This is of course true, but the safety point is that the questions constantly remind the permit-issuing authority to stop, look, think and listen. The monkey may well be on his sore back if these questions are not answered truthfully. The same is true for the question at the bottom of the form.

The only question which the safety department helps answer is that on combustible gas test results; the department does not decide whether a test is necessary. Results reported are negative in most cases; that is, combustible gas is not present. In practice, the test is continued until danger of fire or explosion hazard is nil.

The "Red Tags" mentioned in Blocks 2, 3 and 4 are "warning tags," and generally are attached to valves, pumps, motor starters and the like. Either the person operating the equipment or the one working on it may attach the tag. He alone may remove it unless, for some reason, he cannot be contacted. In this case, his supervisor may remove the tag, but only after

satisfying himself that it is perfectly safe to do so.

"Special precautions" usually refer to work upon machinery or process equipment when it is not feasible to shut down for adjustment or repair. This may also refer to special safety rules adopted by a specific department in addition to the general plant-wide safety rules. All employes entering other departments are required to familiarize themselves with any special written safety rules of that department.

Department supervision is required to list the jobs which must be performed on equipment being operated, for the information of workmen and their supervisors. For each listed job a detailed safe job procedure and the names of personnel permitted to perform them must be prepared in writing. Jobs not listed cannot be performed.

The work permits again illustrate the combination of operations with safety. The theory here is that the supervisor is best fitted to decide whether or not it is safe to authorize work. Certainly he is on familiar ground, whereas a safety man may not be. Since the supervisor of the work detail also must approve the permit, it is certain that at least two supervisors have thought over the job quite carefully from entirely different viewpoints and experience.

Why has the frequency fluctuated in the past two years? The present level is comparable to the national average for chemical plants reporting to the National Safety Council and considerably below the frequency reported for all industry. Consequently, Texas Division safety personnel believe, first, that their program has been and is effective and, second, that much more effort will be required to drive the frequency any lower. But the real explanations they believe, is that the Law of Diminishing Returns is taking its due. As Safety Director Bob Allinson puts it:

"Reducing the frequency rate any further requires an extra amount of added effort just to prevent one lost-time injury. It's like putting power in a speed boat. To jump the speed from 30 to 40 mph. requires doubling the horsepower; to go from 40 to 50 the power must be doubled again. We're now trying to go from 40 to 50 mph. in our safety program boat."

The record has been impressive through the years. The very high frequency rate in the early '40's was partially brought about by the fact that Dow's continually expanding Texas Division was located in an area heretofore devoted to agriculture and fishing. Personnel were recruited from a populace which, for the most part, was totally unfamiliar with industrial operations. In addition, contributing factors were that the plants were new, were using new process, and there was a wartime emphasis on production.

For more on Dow's effective "safety aids" which combine the conventional with the unusual in approach, please turn the page. . . .

Do You Know These Words?

By B. H. Weil
Manager, Information Services
Ethyl Corp. Res. & Engrg. Dept.
Detroit, Mich.

A regular department intended to help administrators and operating men alike keep abreast of technical names and processes in the petrochemical field.

Acetaldehyde

Acetaldehyde, pronounced **"ass-et-al-**duh-hide," is very much of a petrochemical, although only about 5% of its output is sold on the open market. Used principally as an intermediate in the synthesis of acetic acid, n-butanol, acetic anhydride, 2-ethyl hexanol, pentaerythritol, and substituted pryidines, acetaldehyde has the formula $CH_3 \cdot CHO$. It is a colorless, flammable liquid of pungent odor.

Acetaldehyde is synthesized commercially by several different processes. It is derived from ethanol (in turn prepared from ethylene) by either catalytic oxidation or dehydrogenation. It is prepared from acetylene by reaction with water in the presence of a catalyst. Large quantities are prepared (along with other chemicals) by the oxidation of propane and butane.

As will be noted, all of the raw materials are or can be derived from petroleum and natural gas. Ethylene is a constituent of refinery cracked gases or may be prepared from propane or ethane (other refinery gases or LPG). Acetylene is now being produced in large quantities by pyrolysis or partial oxidation of natural or refinery gases. Propane and butane are available as refinery gases or from LPG.

Acetaldehyde is a large-volume petrochemical intermediate—its 1954 output will approximate 700 million pounds. As an intermediate, however, its future depends on developments in the markets for the end-products. While prospects for acetic acid and acetic anhydride do not appear particularly bright, as regards growth, those for the other derivatives seem encouraging. Acetaldehyde seems destined to continue as a most important petrochemical.

Nonylphenol

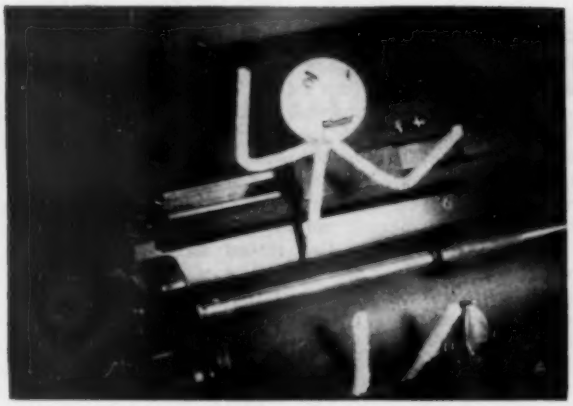
Nonylphenol, sometimes known in the trade as nonyl phenol (two words), is a petrochemical which is derived from two petroleum raw materials. Pronounced **"nohn-**ihl-**fee-**nohl," it has the formula $C_9H_{19} \cdot C_6H_4 \cdot OH$ and is a clear, pale-yellow liquid with a slight phenolic odor. Insoluble in water, it dissolves in many other solvents.

Nonylphenol is prepared commercially by the reaction of a propylene trimer, or a C_9 (nine-carbon-atom) unsaturated hydrocarbon fraction, with phenol in the presence of a catalyst. The chief industrial product from at least one company consists primarily of a mixture of the monononylphenols (phenols containing only one nonyl [C_9H_{19}•] group), chiefly para substituted, that is, the nonyl group is connected to a carbon atom separated by two other carbon atoms from the one containing the phenolic • OH group. The nonyl side chains are random-branched alkyl radicals.

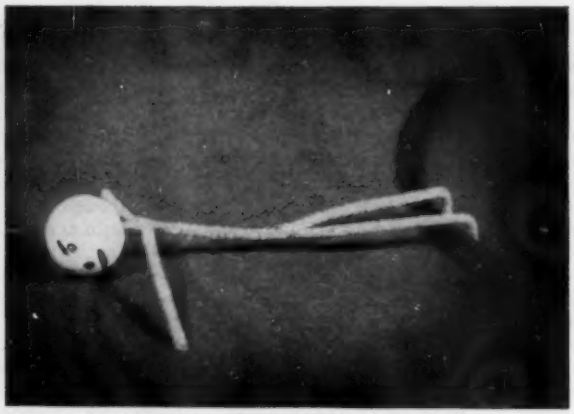
The monononylphenols find principal use in the manufacture of nonionic surface-active agents (emulsifiers, wetting agents, penetrants, dispersants), chiefly by reaction with ethylene oxide. Other uses are the synthesis of stabilizers for ethyl cellulose, plasticizers for cellulose esters, lubricating-oil additives, antioxidants, rubber chemicals, dyestuffs, insecticides, etc.

Propylene trimer, one of the raw materials, is prepared by polymerization of propylene, which itself is a constituent of refinery cracked gases. Phenol is a petrochemical produced from petroleum-derived benzene by several processes.

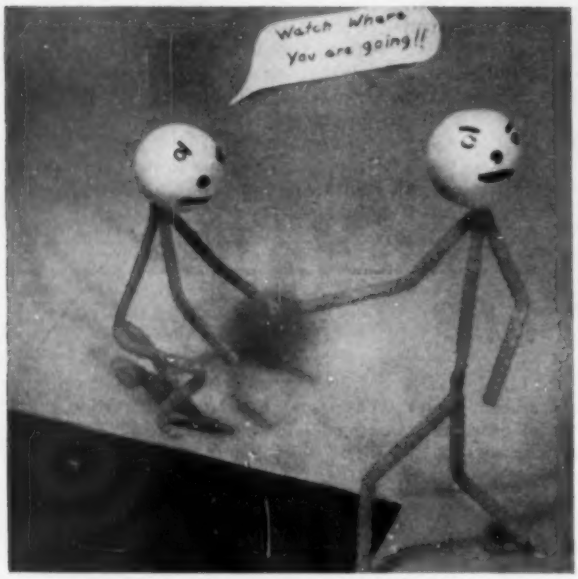
As will be recognized, nonylphenol has properties and uses somewhat similar to those already described in this series for octylphenol. Both look forward to growing markets.



"**DON'T GET CAUGHT** in moving machinery"



"**KEEP THE FLOOR CLEAN** so nobody will trip and fall"



"**WATCH WHERE YOU'RE GOING** or you'll knock me down"

"**YOU CAN'T HEAR THEM** but the sirens were screaming too

Unusual and . . .

Dow Promotes

BOTH the unusual and the conventional—that spells out the effective types of aids used by Dow Chemical Co.'s Texas Division in promoting plant safety. The photographs illustrate both approaches.

The little doll figures were made up and photographs were taken in the preparation of posters for the plant to feature various ways that accidents happen, such as: falls and poor housekeeping, carelessness or inattention, and crushing type injuries.

The mock ambulance call, complete with sirens screaming and a first-aid crew, served to announce the winning of a safety award in a very spectacular and attention-attracting fashion.

On the other hand, the conventional approach also serves well. Dow uses award presentations, poster scoreboards on safety contests, special "consecutive-safe-days-worked" calendars, and company-sponsored social gatherings like barbecues for contest-winning teams.

Beyond these, Dow's program is similar to most of those found in many other large plants across the country. The firm uses safety posters, news bulletins, safety letters, group meetings, protective equipment demonstrations, safety inspections, and the like.

Safety messages and posters are carried on plant busses. Short articles and eye-catching pictures are published in the Texas Division's employe publication, "The Dow Texan." These are usually prepared by one of the safety supervisors whose responsibility includes "outside publicity."

Safety contests were first used in the Texas Division in 1951. The first one involved five teams, the personnel representing a random selection of men. The winner was the team which had the fewest lost-time injuries in the six-month period. Later, teams were created in which the potential hazard of lost-time injuries was approximately equal, prizes being awarded the members of winning teams.

The current contest uses seven teams with a contest period of one year ending May 31, 1955. Each team will compete against its own past safety record in this contest, rather than competing against each other, or using combinations to reach a million man-hours without lost-time injury.

A prize will be awarded at the end of the contest only if the team, or area, has improved on its lost-time record by a minimum of 20%. Value of the prize will depend on the lost-time frequency of the individual's own department. There are two groups of prizes, one about double in value over the other group.

The contest is scored by giving each team 40 points at the beginning of a calendar quarter, making possible a

AWARD PRESENTATIONS are the occasion for special meetings

FAMILY BARBECUES, another reward for safety accomplishments

ANOTHER ACCIDENT-FREE DAY goes up on the outdoor calendar

SAFETY CONTEST SCOREBOARD keeps employes safety-conscious

. . . Conventional

Plant Safety

total accumulation of 160 points during the contest year. To end the contest with a 20% reduction in accident frequency, and win, a team must end the year with no less than 121 points. Some teams cannot have a single lost-time injury to better their previous record 20%; others can have several injuries.

This contest is being publicized by giant scoreboards in each plant, as in the photograph. The team captains are, left to right, the division traffic manager, two assistant general managers, the manager of industrial relations, an assistant general manager, the general superintendent of maintenance and construction, and the director of technical research.

A separate award but which ties into the general contest, also, is the practice of giving certificates within a department for every 100,000 man-hours worked without a lost-time accident. These are cumulative. Company-provided barbecues are awarded a department after it has worked a specified number of man-hours.

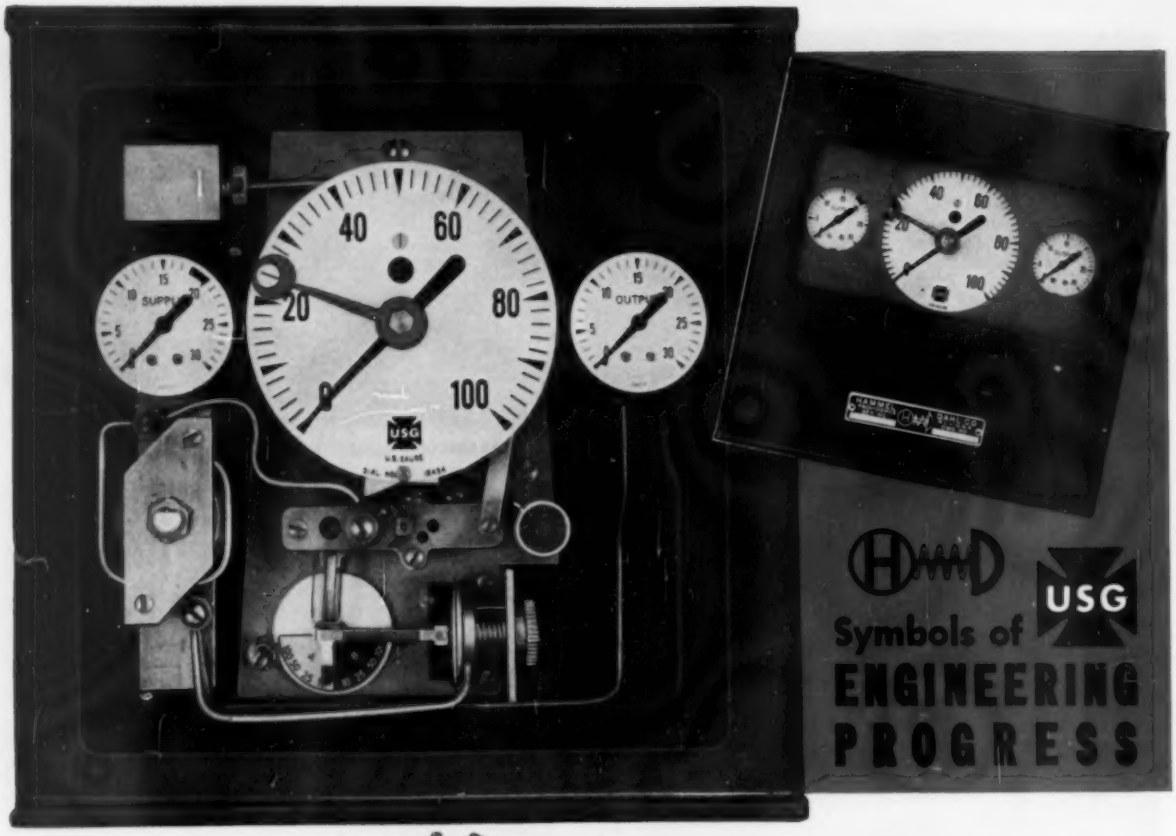
To compensate "small" departments in comparison with large ones, barbecues are in order after working the periods indicated in Table 1.

Table 1—Man-hours to Win Company Barbecue

Size of Department (No. of men)	Man-hours for Barbecue
1 to 15	2,000 calendar days
16 — 40	200,000 man-hours
41 — 60	500,000
61 — 80	400,000
81 — 100	600,000
101 and over	700,000

For every 100,000 man-hour certificate, four passes are awarded—by lot—to department personnel, permitting the holder and guest to fish in "Harris Reservoir," a company owned lake stocked with fish. The safety publicity possibilities during such award presentations are always capitalized upon, as the photographs indicate.

Right now the safety department is trying to find ideas for the next contest and to further help drive down the accident-frequency rate. The secret of any safety program, it is believed, lies solely in the presentation, for no sane person wants to be injured. Repetition is a must, but the presentation must be "new" and constantly changing. Herein lies another value in Dow's decentralized program because, with everybody in the act, there will be little opportunity for the program to settle down to hackneyed routine.



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CHEMICAL PROCESS NEWS

PUBLISHED BY CHEMICAL PROCESS DIVISION, THE M. W. KELLOGG COMPANY DECEMBER 1954

NOTES ON AMMONIA

One of the latest developments in the ammonia field is Kellogg's radical reduction in investment expenditures required to build a plant. As evidence of this, the company was recently awarded a contract for a 300 tons-per-day plant in the Midwest at the unusually low investment cost of about $50 per ton of annual capacity. Comparable plants have run upwards of twice this figure.

* * *

One source of this big saving lies in the fact that previous experience with Kellogg's high-pressure gas reforming-step has resulted in refinements which increase its already high efficiency and more than proportionately decrease its cost. Furthermore, the process will employ only one synthesis section. In addition, operating experience with Kellogg ammonia converters has shown that they can be substantially reduced in size as can the heat exchangers without sacrifice of capacity.

* * *

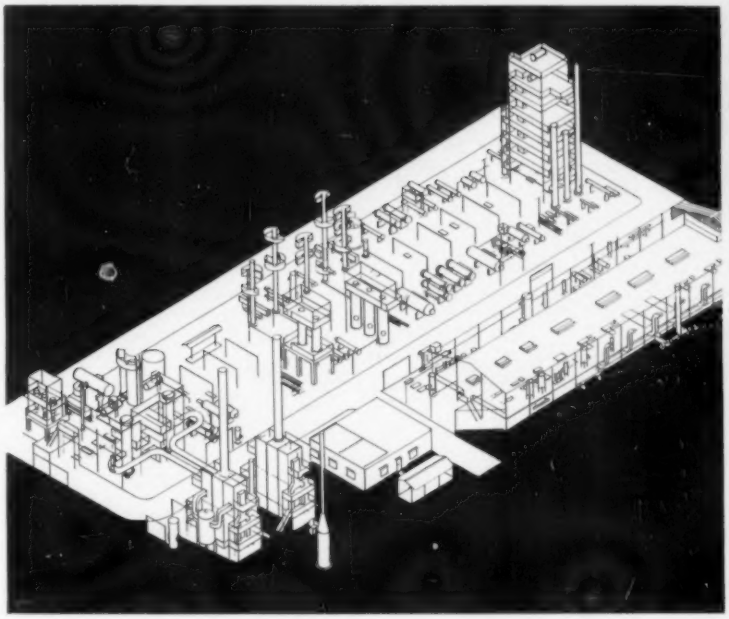
These developments come on top of a considerable amount of ammonia manufacturing know-how which Kellogg has been acquiring since the early 1940's. For example, another of the company's contributions to ammonia synthesis is a reactor which closely approaches the ideal.

* * *

For a reaction rate high enough to produce profitable yields, a special temperature gradient must be maintained in the reactor. This requires extremely close control of temperatures throughout the catalyst beds—a job made more difficult by the fact that the exorthermic reaction occurs at a temperature near that at which catalyst activity begins to deteriorate rapidly and construction materials are threatened by accelerated corrosive attack.

* * *

Kellogg solved this problem with a reactor which employs layers of catalyst with provision for injecting quench between the beds. The result is a converter that effectively controls removal of the heat from the reaction zone, giving virtually point-by-point temperature control throughout.



Second Ethylene Plant to Use the Kellogg Pyrolysis Process is Now Going On Stream in Europe

Marking the second large scale commercial installation so far to employ Kellogg's exclusive steam pyrolysis process, a new ethylene plant is now going on stream near Milan, Italy. The plant is a part of a giant refinery modernization project Kellogg has undertaken for a well known chemicals producer. It includes a feed preparation section in which the heavy raphtha and gas oil feed stock is distilled from crude oil, a steam pyrolysis section in which the feed is cracked at high temperatures, and a recovery section which separates ethylene and other olefin products.

In addition to this plant, Kellogg is currently engaged in building another ethylene plant in England, the second such installation for the same producer. This plant, like its predecessor which Kellogg built three years ago, will utilize heavy naphtha for the primary production of ethylene which in turn will go into the manufacture of polyethylene.

Completion of the Italian plant, together with the other one underway, is indicative of a trend abroad which is expected to have more and more significance in the U. S.

Ethylene markets on both sides of the Atlantic have skyrocketed in the last few years. Forecasts are for even bigger demands in the not too distant future. In supplying these demands to date, U. S. producers have for the most part concentrated on cracking gaseous feeds—principally ethane and propane recovered from natural and refinery gases.

European producers, however, motivated by a lack of sufficiently large quantities of "crack-able" gases, have found it profitable to manufacture ethylene from heavier petroleum fractions. Important as a key to this movement—which was spearheaded three years ago by the British producer who built the first plant—has been Kellogg's steam pyrolysis design, developed specifically for such feed stocks.

The significance of this development to the domestic picture stems from several facts: First, the success of Kellogg's pyrolysis process has been proved in lengthy commercial operation to have superior advantages in high yields without excess coking. Second, the same principle can be adapted to the use of such feedstocks as casinghead or natural gasoline, re-

(continued on reverse side)

(continued from previous page)

siduals, and other low value products which tend to be in over supply in the U. S. And third, the principle is also adaptable to conventional feeds, where pilot plant studies have shown the process to have the same advantages in high yields and low coking that it has shown with heavier feeds.

Consequently, for domestic producers, this means the availability of a new, proved ethylene process which greatly enlarges the field of raw materials that can be processed economically. It offsets any dependence on the present price structure of natural gas, and it can also offset dependence on refinery product raw materials, for economic studies based on Kellogg pilot plant data indicate that crude oil, itself, can be profitably processed to yield a maximum of olefins.

High Conversion, High Purity Mark Steam Pyrolysis Process For Ethylene

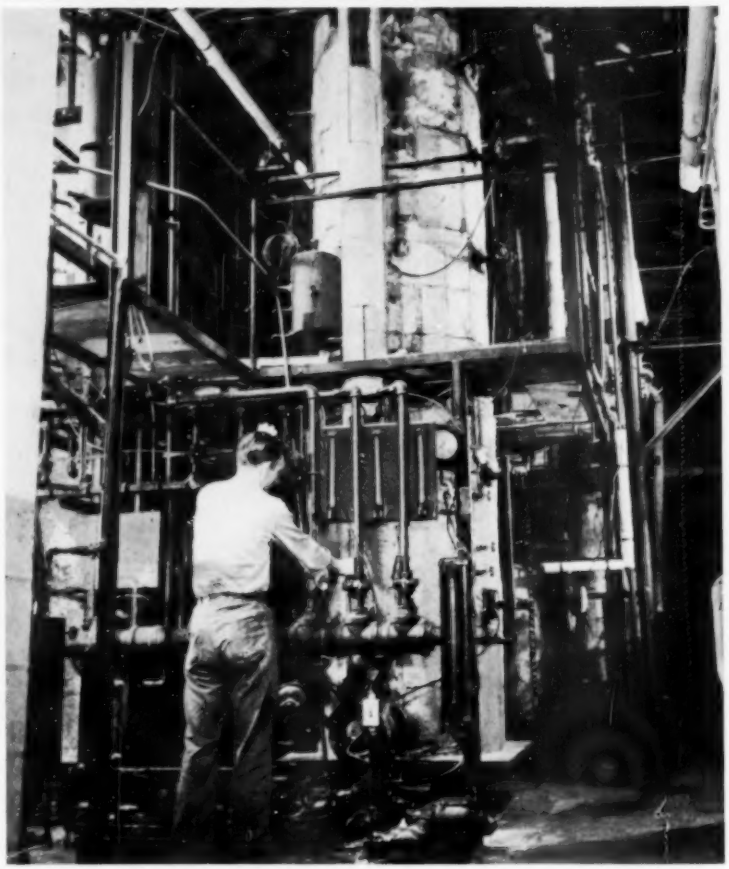
Kellogg's process for cracking petroleum feedstocks to produce ethylene employs a unique concept in the tailoring of petrochemical intermediates. This concept involves the use of superheated steam to: (1) supply heat for vaporization of the charge (in the case of a liquid feed); (2) reduce the partial pressure of the charge in the flash drum to a point that allows vaporization at a relatively low temperature, thus minimizing cracking in this step; and (3) to reduce the partial pressure of the charge in the high temperature pyrolysis step, thus insuring a higher rate of cracking of the feed and increased yield of olefins.

Results obtained with this process—both commercially and in exhaustive pilot plant studies—have been characterized by excellent yields of high purity olefins. In most instances, yields have exceeded any so far achieved using conventional cracking methods.

At the same time, it has shown a remarkable ability to suppress formation of coke in the furnace—one of the inherent disadvantages of conventional ethane and propane pyrolysis systems. Furnace coking in Kellogg's process has at no time been significant. Indications are that commercial plants using any of the possible feeds for olefin production could be operated continuously at high conversions without the need for spare cracking furnaces.

Economy of operation is attained by quenching after pyrolysis in waste heat boilers. When using the steam cracking process, full heat recovery at this point is achieved with only infrequent bypassing for cleaning of quench boilers. During normal operation, the boilers provide all the process steam required for the pyrolysis step.

Ethylene Pilot Plant Studies Continue



This is a view of the pilot plant in Kellogg's Jersey City laboratories where continuing studies are being carried out using various adaptations of the steam pyrolysis process to make ethylene from ethane, propane, and other feed stocks. Petroleum residuals and low value liquid fractions have also been studied extensively, and indications are that production of ethylene from crude oil itself would be an economically feasible operation.

For further information, technical data, etc., relating to chemical or petrochemical processing, write

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LOOKED HOPELESS, yet plant's own product repaired this leak (see right)

Polyester Resin Mends Rusted Water Lines

A LARGE water line that is completely rusted through usually would be considered a complete loss. This would be especially true at the Bishop, Texas, plant of Celanese Corp. of America where about 40 ft. of a water header pipe had eroded and rusted leaving large holes and paper thin walls. There were about 20 holes below the water level of the pipe.

Rather than replace this defective pipe length, Celanese repaired it using glass cloth saturated with some of their own self-curing polyester resin. Applying the cloth over the holes plugged the leaks. Two additional layers of resin-saturated glass cloth wrapped one at a time around the entire rusted area of the pipe gave it additional strength.

The repaired pipe is strong enough for a man to stand over one of the completely rusted-through areas. In case the repair layers rupture, resin-saturated glass cloth can be applied to the damaged area. Complete repair of the pipe was accomplished with no process down-time, as it was not necessary to remove the pipe or any of its fittings.

Stop Pitting in Stainless Steels

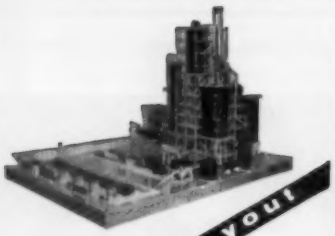
Problem: What are some remedies for pitting and subsequent failure in Type 304 stainless steel relief valve seats? The pitting was found chiefly in a crude still, mostly on vapor service at normally low temperatures. The crude supply contains approximately 50% Arabian crude.

Suggested solution: This form of corrosion attack is not uncommon with the austenitic as well as the ferritic, or straight chromium, types of stainless steel in the service in question. Undoubtedly, the crude contains some brine or chlorides which subsequently hydrolyze during processing and form small amounts of hydrochloric acid.

It is well known that the materials mentioned above are susceptible to localized attack in the form of pitting when used in contact with halogen salts or solutions; frequently leading to early failure of service life. Plant test corrosion data gives ample evidence of the potent effect the presence of hydrochloric acid formed by hydrolysis in crude oil has in inducing pitting attack on the stainless steel alloys.

The same data has demonstrated the usefulness of Monel under such conditions from the standpoint of a low overall corrosion rate and resistance to pitting attack. Monel is being widely used as a valve seat material in many

Industrial Models Inc.



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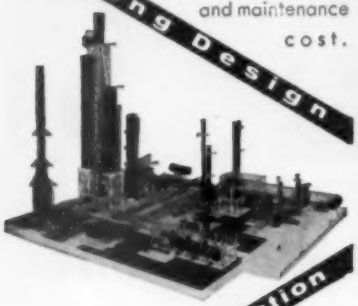

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services involving dilute hydrochloric acid solutions at moderate temperatures.

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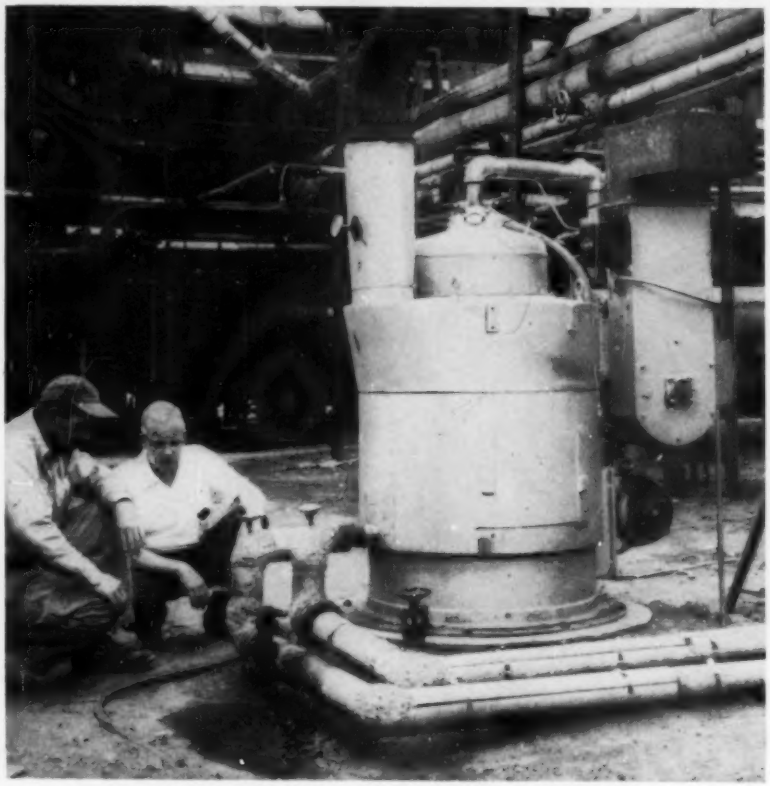
The preceding article is based on information developed during a conference in Montreal for representatives of several Canadian oil companies and of International Nickel Co. of Canada Ltd. It was prepared for PETROLEUM PROCESSING by John F. Mason, Jr., corrosion engrg. section, development and research dept., International Nickel, New York City. A major portion of Mr. Mason's work appeared in an article in the Sept., 1953, issue, pp. 1332-5.



PACKAGED HEATER UNIT which showed Oriental Refining . . .

How to Cut Reduced Crude Yield

DECREASING reduced crude yield from crude distillation units is a problem of increasing significance to the petroleum refiner. While such processes as cracking, reforming, coking, and visbreaking are available for this purpose, they require large capital outlays.

Oriental Refining Co. of Denver, Colo., has been able to realize a 12% decrease in reduced crude yield by heating and recycling a portion of the reduced crude back to the crude distillation column feed.

Previously the crude distillation column processed 3500 b/d crude feed (146 b/hr.) and got 60 b/hr. overhead products — gasoline, kerosine and diesel distillates—and 86 b/hr. reduced crude which left the column at about 630° F.

Oriental now withdraws 15 b/hr. of the reduced crude and heats it to 780° F. in a small gas-fired Vapor-Clarkson hot oil heater. Then the heated reduced crude is pumped back to crude column feed. The overhead yield has been increased to 70 b/hr. (+16%) and the reduced crude decreased to 76 b/hr. (—12%).

Fuel for the heater is uncondensable gas from a thermal cracking unit with 1500 Btu heat content which enters the heater burner at 3 to 6 oz. pressure. The heater itself is no larger than a household refrigerator, but develops 760,000 Btu/hr. heat duty for the 15 b/hr. of reduced crude passing through it. It is made by Vapor Heating Corp. of Chicago. Oriental Refining has several other uses in mind for the little unit: such as reheating cracked residue for further refining and heating tank bottoms prior to cleaning. However, such applications will require another heater.

Me - I could write a buyer's guide!

When it comes to equipment, you can't fool maintenance men. They know what stands the gaff—and what doesn't. They also know a lot of their work is due to faulty selection of equipment —mistakes in judgment of quality, mainly.

In buying valves, such mistakes usually happen when someone buys on price alone, or because "all valves look alike." In either case, today's penalty is excessive maintenance at the highest labor rates in history. And where valve trouble causes production loss, it, too, was never costlier.

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Notice the difference in sludge on the oil screen and timing gear cover on the left as compared to the clean appearance of the corresponding parts at the right. Those on the left were operated on a representative heavy-duty motor oil (for service MS and DG). The cleanliness of those on the right resulted from the use of the same base oil to which only Du Pont Lube Oil Additive 564 plus an antioxidant had been added.

. . . polymeric additives offer solution to your low-duty sludge problems

A new solution to engine oil sludge problems, particularly those caused by low-power, low-temperature, and other low-duty driving conditions is now possible. This is especially significant in helping promote your product to the mass passenger car market, and is also of interest to the operators of urban fleets—taxis, buses and delivery services.

The solution of sludge problems is available through the use of new polymeric lube oil additives by Du Pont. Being outstanding detergents and viscosity-index improvers, these double-action additives are exceptionally effective under stop-and-go driving conditions. They are especially effective in retarding sludge formation on all engine parts in contact with lubricating oil. As a result, Du Pont Polymeric Lube Oil Additives help maintain good engine lubrication and extend the useful life of your customers' engines.

Leave No Deposit

Polymeric lube oil additives, being ashless detergents, permit more efficient operation of the engine oil system. Oil screens and filters are kept clean and free from sludge. The resulting free flow of oil through the engine keeps it in better operating condition.

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Du Pont Polymeric Lube Oil Additives are effective in low concentrations. And, when used in multi-graded oils, result in substantial savings since these new additives are both detergents and V.I. improvers. They are supplied in two molecular weights—Lube Oil Additive 564 (formerly PL-164A) and Lube Oil Additive 565 (formerly PL-164).

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By Peter J. Gaylor, Patent Attorney, Elizabeth, N. J.

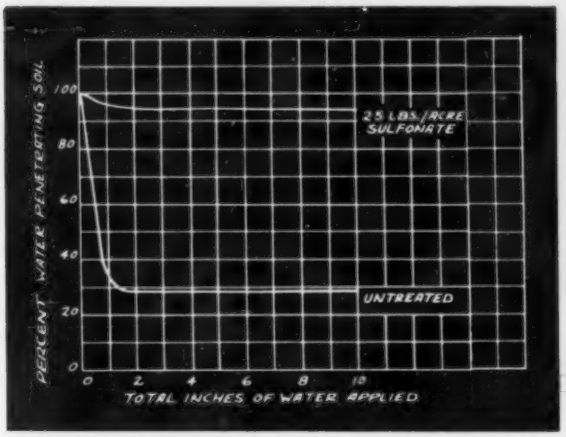

FIG. 1—Effect of sulfonate on water penetration of soil

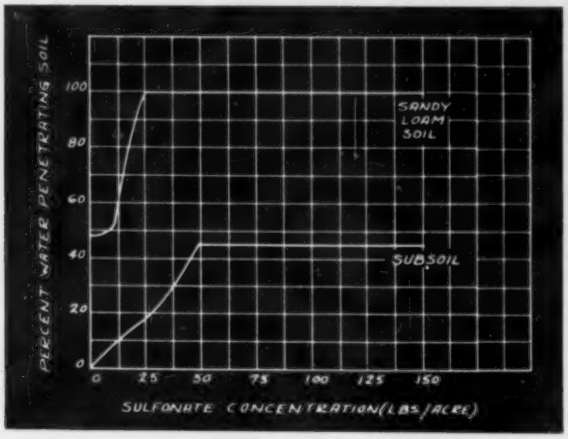

FIG. 2—How water penetration varies with type of soil

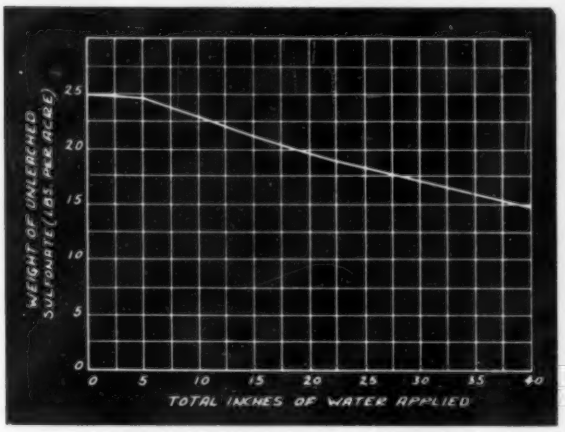

FIG. 3—Leaching of sulfonate out of soil

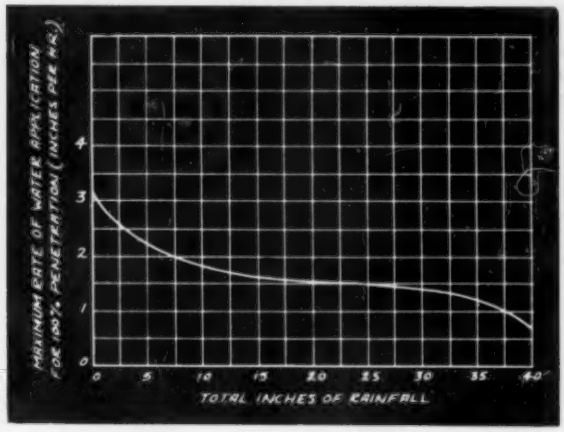

FIG. 4—Amount of water needed for 100% penetration

Sulfonates Said to Reduce Erosion by Increasing Water Absorption of Soil

THE idea of using so-called "surface-depressing" agents with plant nutrients for soil is not new. While such chemicals may be effective for stimulating growth of vegetation spectacular and unexpected results are claimed for treatment of soil with certain alkyl benzene sulfonates.

According to the Atlantic Refining Co. patent No. 2,689,173, not only do these compounds effect phenomenal plant stimulation, but, in addition, their use in arid lands reduces or eliminates substantially soil erosion due to heavy rainfall, flash floods, etc. These results are claimed to be due to the action of the alkyl benzene sulfonates in reducing the surface tension of water more than 25 dynes per cm. at 25° C. in water of 300 ppm. hardness and at a concentration of 0.001%. None of the previously used "surface-depressing" materials is reputed to be able to lower the surface tension more than 5 dynes per cm.

The sulfonates used are those having an alkyl group of at least five carbon atoms, and monoalkyl benzene sulfonates in which the alkyl group contains at least nine carbon atoms and preferably 9 to 15. Examples are sulfonates of nonyl benzene, nonyl diethyl benezene, nonyl methyl propyl benzene, undecyl benzene, etc.

It is claimed to have been found that vegetation irrigated or watered in presence of these alkyl benzene sulfonates requires only about one-third as much water to prevent wilting as would be normally required with water alone, thus offering the possibility that vast arid areas of unproductive and highly alkaline soils could be converted into grazing or farming land through frugal irrigation employing small concentrations of alkyl benzene sulfonates, which decompose eventually into products that acidify the soil.

The production of these sulfonates is said to be described in patents Nos. 1,992,160, 2,232,118, 2,430,673, 2,477,372 and 2,477,383. A preferred product is made by sulfonating benzene alkylated with C_{12} propylene polymer.

Fig. 1 shows the relationship of water penetration of the soil and total inches of rainfall (water applied) for untreated soil and for soil treated with C_{12} alkyl benzene sodium sulfonate. In the case of untreated soil, the initial water that fell on the dry soil was com-

pletely absorbed. After the soil was wetted, only a part of the water was absorbed, the remainder running off the surface. As additional water was applied, the amount absorbed gradually decreased until the soil was wetted throughout its entire depth, at which time only 28.5% of the water being applied was absorbed, and this proportion remained during further spraying.

In the case of the treated soil, even after the surface was wetted, the soil continued for some time to absorb all of the water. When the entire depth of the soil was wetted, 95.1% of the water added to the surface thereafter continued to be absorbed.

An examination of Fig. 2 will show that 25 lbs./acre of sulfonate was sufficient to obtain 100% penetration of the sandy loam soil at 2 in. of water per hour, as compared with 50 lbs./acre required for a maximum water penetration of subsoil, namely 45.3%, showing that the amount of sulfonate required is dependent upon the type of soil involved.

From Fig. 3 it is seen that even after 16 in. of water have been applied to the soil, 21 lbs./acre of the sulfonate still remains in the soil; and after a total of 40 in. of water, only 59.2% of the sulfonate has been leached out.

From Fig. 4 it will be apparent that the soil is still capable of absorbing 100% of the water applied at a rate of over 1.5 in. per hour after a total of 20 in. was applied.

Tests are described on shrubs, fruit trees, grass, etc.

Patents Issued in October

The following classified listing gives the patent number, patentee, or assignee, and a brief description of all patents believed to be of interest to the petroleum processing industries, as contained in the Official Gazette of the U. S. Patent Office for October 5, 12, 19, and 26, 1954, Vol. 687, Nos. 1-4.

PROCESSES

Refining

2,690,961 (Sinclair Refining Co.) Recovery of sulfur from H_2S by oxidation to SO_2 and contacting further with H_2S.
2,690,989 (Phillips Petroleum Co.) Method of preventing hydrogen sulfide hydrate formation.
2,691,009 (Phillips Petroleum Co.) Separation process, using urea.
2,691,054 (Jones & Laughlin Steel Corp.) Purification of aromatic hydrocarbons to remove paraffins by $AlCl_3$ and TiO_2.
2,691,622 (Sun Oil Co.) Process for refining petroleum with boron fluoride and a tertiary alkyl monofluoride.
2,692,222 (Standard Oil Development Co.) Combination deasphalting, phenol treating, and dewaxing process.
2,692,227 (Phillips Petroleum Co.) Azeotropic distillation of straight chain paraffins from mixtures with branched chain paraffins with perfluoro compounds.
2,692,656 (Union Oil Co. of Calif.) Adsorption by and reactivation of granular adsorbents.
2,692,849 (Elmer H. Hyde) Method and means for treatment of coal distillation gases and vapors.

Catalysts

2,692,239 (Standard Oil Development Co.) Process of preparing a magnesia hydrosol and magnesia hydrogel.
2,692,240 (Du Pont Co.) Reactivation of alumina supported palladium catalysts.
2,692,241 (Universal Oil Products Co.) Production of phosphoric acid and manganese containing catalysts.
2,692,242 (Universal Oil Products Co.) Production of tin or lead containing phosphoric acid-siliceous catalyst.
2,692,863 (Du Pont Co.) Process of preparing a silica organosol and resulting product.

Conversions

2,690,955 (Houdry Process Corp.) Contacting solids and gases using moving bed of granular material.
2,690,990 (Standard Oil Development Co.) Production of motor fuels from heavy hydrocarbon oils in a two-stage conversion process with inert solids in fluidized system.
2,690,991 (Standard Oil Development Co.) Catalytic cracking of hydrocarbons in two stages in fluidized system.
2,691,573 (Phillips Petroleum Co.) Desulfurization in the gasification of coal.
2,691,623 (Union Oil Co.) Hydrocarbon conversion process, using hydrodesulfurization.
2,692,223 (Standard Oil Development Co.) Combination solvent refining and catalytic cracking process.
2,692,224 (Houdry Process Corp.) Hydrogenative cracking of heavy hydrocarbons in the presence of hydrogen fluoride and a platinum-charcoal catalyst composite.
2,692,225 (Phillips Petroleum Co.) Residuum cracking in a pebble heater.
2,692,226 (Standard Oil Development Co.) Shale oil refining process using hydrogenation.
2,692,261 (Standard Oil Co.-Ind.) Polymerization of ethylene with nickel or cobalt on activated carbon.
2,692,292 (Du Pont Co.) Oxidative dehydrogenation reactions of cycloalkanes.
2,692,293 (Houdry Process Corp.) Catalytic dealkylation of aromatic hydrocarbons.
2,692,295 (Standard Oil Co.-Ind.) Polymerization of olefins with catalyst of cobalt on coconut charcoal pretreated with nitric acid.
2,692,846 (Houdry Process Corp.) Upgrading gasoline and naphtha with molybdena-magnesia catalyst.
2,692,847 (Standard Oil Development Co.) Fluid hydroforming operation, using group VI metal oxide catalyst.
2,692,848 (Universal Oil Products Co.) Method and means for contacting subdivided catalyst particles successively with a reactant stream and regenerating gas streams.
2,692,864 (Universal Oil Products Co.) Dispersephase countercurrent contacting of subdivided particles.
2,692,903 (Phillips Petroleum Co.) Method for converting hydrocarbons in a pebble heater.

Hydrocarbon Synthesis

2,690,963 (Standard Oil Development Co.) Preparation of hydrocarbon synthesis gas in fluidized system.
2,691,033 (Gulf Research & Development Co.) Method of starting up hydrocarbon synthesis units using iron catalyst.
2,691,034 (The Texas Co.) Method of synthesizing gasoline hydrocarbons.
2,692,192 (Standard Oil Development Co.) Fluidized treating operation for producing CO and hydrogen.
2,692,274 (Rheinpreussen Aktiengesellschaft fur Bergbau und Chemie) Process for catalytic reduction of carbon dioxide with hydrogen.

PRODUCTS

Chemicals

2,690,993 (M. W. Kellogg Co.) Separation of organic acids from oxygenated organic compounds by azeotropic distillation with water.
2,690,995 (Stanolind Oil & Gas Co.) Process of recovery of oil soluble alcohols by azeotropic distillation with isopropyl alcohol.
2,691,036 (William T. Miller) Allylic replacement of unsaturated perhalocarbon compounds.
2,691,040 (Universal Oil Products Co.) Sulfonation of organic compounds with sulfur trioxide.
2,691,045 (Eastman Kodak Co.) Production of oxygenated compounds from CO, olefins and hydrogen employing sulfactive catalyst.
2,691,046 (Eastman Kodak Co.) Process for the manufacture of oxygenated compounds with improved catalysts (cobalt carbonyl).
2,691,047 (Eastman Kodak Co.) Preparation of oxo aldehydes using glycol solvents.
2,691,048 (Socony-Vacuum Oil Co.) Separation of glycols and glycol ethers.
2,691,052 (Phillips Petroleum Co.) Purification of perfluorocompounds.
2,691,625 (Ethyl Corp.) Recovery of benzene hexachloride by steam distillation.
2,691,636 (California Research Corp.) Detergent compositions (C_{12}-C_{22} alkyl sulfates, etc.).
2,691,646 (Standard Oil Development Co.) Copolymers of multiolefins with vinyl ethers and method of making same.
2,691,647 (Standard Oil Co.-Ind.) Conversion of ethylene and/or propylene to solid polymers in the presence of group 6a metal oxides and alkali metals.
2,691,669 (Stanolind Oil & Gas Co.) Extraction of organic compounds with carboxylic acid salts.
2,691,814 (Glacier Metal Co. Ltd.) Polytetrafluorethylene impregnated bearings.
2,692,211 (Lovell Chemical Co.) Process for drying a cyclic pentene impregnated asbestos sheet.
2,692,255 (B. F. Goodrich Co.) Modification of alkali metal catalyzed polymerization of conjugated diene hydrocarbons.
2,692,257 (Standard Oil Development Co.) Ethylene polymerization with conditioned alumina-molybdena catalysts.
2,692,258 (Standard Oil Co.-Ind.) Ethylene polymerization with molybdena-group 4a catalysts.
2,692,259 (Standard Oil Co.-Ind.) Polymerization of conditioned olefin charging stocks with molybdenum catalysts.
2,692,277 (Distillers Co. Ltd.) Manufacture of cyclohexanols and esters thereof, from isopropyl alcohol or secondary butyl alcohol.
2,692,283 (Shell Development Co.) Method for preparing imines.
2,692,284 (Shell Development Co.) Method for preparing ketimines.
2,692,286 (California Research Corp.) Preparation of quaternary ammonium halides.
2,692,289 (Distillers Co. Ltd.) Manufacture of 1:1:3-trimethyl-cyclohexanone-5.
2,692,294 (Phillips Petroleum Co.) Manufacture of acetylene and ethylene.
2,692,868 (Du Pont Co.) Process for preparing silica-containing polymeric compositions with peroxysilica catalyst.
2,692,872 (Phillips Petroleum Co.) Coagulating unsaturated organic compound-sulfur dioxide resins.
2,692,892 (Phillips Petroleum Co.) Hydroxypolybutadiene and esters thereof.
2,692,899 (Ethyl Corp.) Pentachlorophenol.
2,692,901-2 (Hydrocarbon Research, Inc.) Process for producing acetylene by partial combustion of hydrocarbons.

Fuels

2,690,964 (Aerojet-General Corp.) Process for gelling liquid nitroparaffins with nitrocellulose.
2,691,572 (California Research Corp.) High sulfur diesel fuel containing organic lead salts.
2,692,191 (The Texas Co.) Unsaturated mineral oil distillate (gasoline-fuel oil) containing a mercaptobenzimidazole and an arylidene amine.
2,692,821 (Gulf Research & Development Co.) Stable fuel oil compositions containing salt of hydrogenated rosin.
2,692,888 (The Texas Co.) Synthetic diesel fuel from CO and hydrogen.

Lubrications

2,690,998 (The Texas Co.) Metal soap grease containing alkaline earth metal phenolate.
2,690,999 (California Research Corp.) Silver protective agents for sulfur-containing lubricants.
2,691,000 (C. C. Wakefield & Co.) Lubricating oils containing ester of acetic acid having sulfur or selenium atom.
2,691,001 (Standard Oil Development Co.) Mineral lubricating oil composition containing isopropylidine bis (2-isopropylphenol) inhibitor.
2,691,002 (Standard Oil Co.-Ohio) Method of processing solvent-extracted lubricating oil by treatment with phosphorus pentasulfide and potassium hydroxide and the resulting products.
2,691,632 (California Research Corp.) Oil compositions resistant to oxidation, containing tetramethyl thiuram disulfide, butyl xanthogen and phenyl-a-naphthylamine.
2,691,633 (California Research Corp.) Lubricants comprising waxy mineral oil, silicates, and a phthalyl chloride acylated tetra paraffin-alkylated phenol.
2,691,634 (California Research Corp.) Lubricant composition comprising a mixture of waxy mineral oil, poly-1,2-oxy-propyleneglycol and a phthalyl chloride acylated tetra-paraffin-alykylated phenol.
2,691,648 (Hercules Powder Co.) Sulfurized terpene composition.
2,692,232 (Standard Oil Development Co.) Lubricating grease compositions from hydroxy phenyl fatty acids.
2,692,233 (Standard Oil Development Co.) Synthetic lubricant (diesters of adipic acid.)

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2.692.858 (C. C. Wakefield & Co. Ltd.) Castor oil lubricating composition containing tin or antimony salt and aromatic sec. amine.
2.692.859 (Shell Development Co.) Metal-working lubricant comprising water and alkyl phenol-ethylene oxide reaction product and nitrite.

Specialties

2.690.960 (Godfrey L. Cabot Inc.) Detonation process of making carbon black.
2.690.965 (Standard Oil Development Co.) Herbicidal composition (petroleum oil emulsion for celery plots).
2.690.976-7 (Standard Oil Co.-Ohio) Asphalt blend containing P_2S_5 products.
2.690.978 (Atlas Powder Co.) Bituminous emulsion containing ethylene oxide amine reaction product.
2.691.621 (Phillips Petroleum Co.) Improved asphalt compositions and method of producing same from cracked residium.
2.691.631 (Socony-Vacuum Oil Co.) Method of inhibiting corrosion with sodium mercaptobenzothiazole.
2.692.202 (Universal Oil Products Co.) Stabilization of organic compounds with monoalkyl ether of dihydroxy-hydronaphthalene inhibitor.
2.692.231 (California Research Corp.) Microbiocidal water treatment with long chain alkyl benzyl trimethyl ammonium halide.
2.692.278 (Standard Oil Development Co.) Process for preparing triethanolamine mahogany sulfonates.
2.692.280 (Standard Oil Co.-Ind.) Recovery of naphthenic acids.
2.692.835 (Gulf Research & Development Co.) Paraffin wax compositions containing bis (2-hydroxy-3-t-butyl-5-methyl phenyl) alkane antioxidant.
2.692.860 (Gulf Research & Development Co.) Antifreeze compositions, comprising ethylene glycol, sodium nitrite, sodium mercaptobenzothiazole, etc.

EQUIPMENT

Processing, general

2.690.613 (Clifford F. Bishop) Condenser tube extractor.
2.690.756 (Zoltan O. St. Palley and Lionel I. Rivard) Apparatus for cleaning pipe lines.
2.690.813 (Pierre Diebold) Separator for dust-carrying gases.
2.690.955 (Houdry Process Corp.) Contacting solids and gases.
2.690.962 (Standard Oil Development Co.) Vessel for contacting gaseous fluids and solids.
2.691.271 (Frank J. McDevitt) Waste heat power plant, including air turbine cycle.
2.691.423 (Herbert Simpson Corp.) Dust collector.
2.691.427 (Mine Safety Appliances Co.) Dust filtering apparatus.
2.691.481 (U. S. Atomic Energy Comm.) Vacuum-pumping apparatus.
2.691.482 (Equi-Flow, Inc.) Method and apparatus for compressing and expanding gases.
2.691.508 (Pure Oil Co.) Floating head assembly for shell and tube type cooler or heat exchanger.
2.691.509 (Eugene Rivoche) Method and apparatus for supplying fuel.
2.691.558 (Carter Carburetor Corp.) Pump packing.
2.691.665 (National Cylinder Gas Co.) Method and apparatus for deodorizing oils.
2.691.966 (Paul G. Young) Fluid fuel fired water-tube steam boiler.
2.691.991 (General Motors Corp.) Heat exchange device.
2.692.014 (Jet-Heet, Inc.) Burner for liquid and gaseous fuels.
2.692.026 (Apex Electrical Mfg. Co.) Self-unloading centrifugal separator.
2.692.051 (Harvey R. Webb) Water and oil separator.
2.692.128 (Socony-Vacuum Oil Co.) Fractionating tray.
2.692.129 (Standard Oil Development Co.) Total drawoff tray for fractionating towers.
2.692.702 (Phillips Petroleum Co.) Pebble feeder.
2.692.764 (Howe-Baker Corp.) Mixing apparatus.
2.692.819 (Wulff Process Co.) Furnace and apparatus for producing acetylene by the pyrolysis of a suitable hydrocarbon.

Instruments

2.690.694 (Standard Oil Development Co.) Light absorption analysis method.
2.690.768 (American Steel Foundries) Pressure responsive device.
2.691.107 (Consolidated Engineering Corp.) Mass spectrometry.
2.691.108 (Consolidated Engineering Corp.) Mass spectrometry.
2.691.135 (Goodyear Tire and Rubber) Leak detector.
2.691.223 (Phillips Petroleum Co.) Liquid level gage.
2.691.296 (Liquidometer Corp.) Liquid gravity and weight gage.
2.691.298 (Socony-Vacuum Oil Co.) Filter cake thickness gage.
2.691.302 (Reed Roller Bit Co.) Pressure-measuring apparatus.
2.691.303 (Phillips Petroleum Co.) Magnetic type flowmeter.
2.691.304 (Simmonds Aerocessories) Liquid contents gage.
2.691.737 (General Power Plant Corp.) Apparatus for determining and recording the dust content of flue gas.
2.691.855 (Corning Glass Works) High-temperature thermometer tube and glass.
2.691.892 (H. J. Elliot Ltd.) Beckman thermometer.
2.691.893 (Adolph F. Meyer) Differential pressure gage.
2.692.500 (Egon Muhlner) Fluid meter.
2.692.501 (Vapor Recovery Systems Co.) Pressure-measuring apparatus.
2.692.502 (Fred H. Warren) Automatic liquid sample dispenser.
2.692.528 (Specialties Development Co.) Apparatus for visual detection of suspended matter in fluids.
2.692.955 (McQual-Norris Mfg. Co.) Remotely adjustable thermostat.

Pumps & Compressors

2.690.714 (Clark Equipment Co.) Control mechanism.
2.690.715 (Barret H. McLaughlin) Rotary pump.
2.690.716 (Louis C. Pope) Hydraulic pumping apparatus.
2.690.868 (Cooper-Bessemer Corp.) Compressor valve structure.
2.690.869 (Arthur E. Brown) Rotary mechanism for use with fluids.
2.691.346 (F. E. Myers & Bro. Co.) Double rotary fluid pump.
2.691.347 (Robbin and Meyers, Inc.) Helical gear pump with backed-up nonrigid casing.
2.691.348 (Johannes Joseph Gunther) Ball piston pump.
2.691.349 (Ernest A. Cuny) Rotary pump.
2.691.388 (Bendix Aviation Corp.) Pressure-regulating valve for pumps.
2.691.942 (Philip E. Kopp) Pressure-generating device.
2.691.943 (Lapp Insulator Co.) Diaphragm pump.
2.691.944 (Bruno Carl Grosskopf) Machine of the centrifugal type.
2.691.945 (Borg-Warner Corp.) Pressure loaded gear pump.
2.692.559 (Easy Washing Machine Corp.) Centrifugal pump.
2.692.563 (John J. Kovacs) Impeller.
2.692.564 (Henry J. Miller) Ejector device.
2.692.681 (Easy Washing Machine Corp.) Centrifugal support.
2.692.704 (Cyril C. Benz) Pneumatically operated liquid pump.

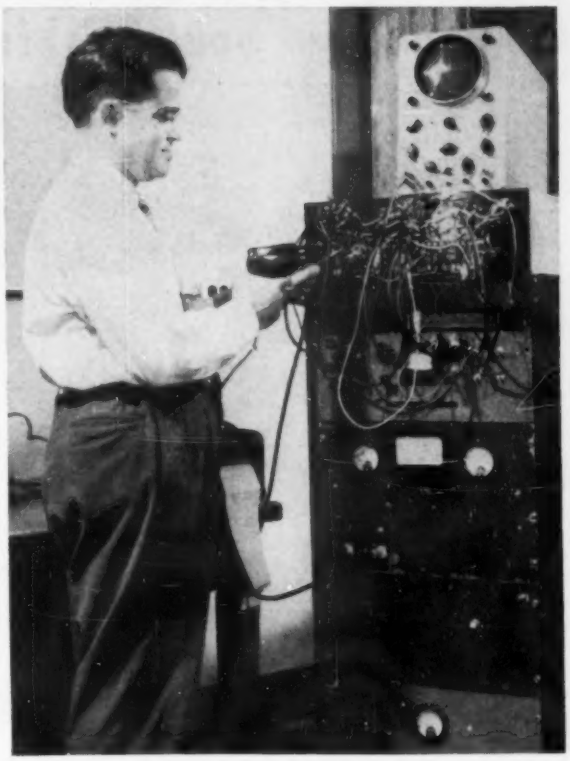
Tanks

2.690.778 (Dunlop Rubber Co., Ltd.) Container for storage of liquids.
2.691.282 (Howard J. Snelson) Cooling and storage apparatus for liquids.

Valves & Fittings

2.690.760 (Reynolds Gas Regulator Co.) Fluid pressure regulating system.
2.690.767 (Electro-Hydraulic, Ltd.) Selector valve mechanism.
2.690.894 (Orbit Valve Co.) Valve operating mechanism.
2.690.895 (Bar-Jon Mfg. Co.) Valve.
2.691.386 (Earle H. Madison) Fluid level safety control valve.
2.691.504 (George O. Jones) Diaphragm type pilot and main valve.
2.691.773 (U. S. Atomic Energy Comm.) Valve leak detector.
2.691.827 (Sheffield Corp.) Adjustable orifice unit.
2.691.988 (Weatherhead Co.) Sealed pressure regulator.
2.691.990 (Electrol, Inc.) Selector valve.
2.692.113 (The Patrol Valve Co.) Automatic solenoid valve closing device.
2.692.114 (Air Reduction Co.) Reversible flow circuit fluid control valve.
2.692.164 (Armstrong Cork Co.) Method and apparatus for controlling differential flow of materials.
2.692.606 (John Stepanian) Safety and control device for gaseous media.
2.692.607 (North American Aviation) Flow proportioning device.
2.692.611 (Edward A. Rockwell) Proportional pressure valve.
2.692.612 (Phillips B. Drane) Pressure controlled flow regulator valve.
2.692.613 (American Machine and Metals, Inc.) Multiple weighted relief valve.
2.692.614 (Roy D. McLeod) Control valve.
2.692.615 (Eaton Mfg. Co.) Flow control mechanism.
2.692.800 (General Electric Co.) Nozzle flow control.
2.692.923 (William Ash) Float operated switch and fluid dispensing conduit.

UOP Engineer Builds His Own



Dave Boyd is seen here with one of his most precocious brainchildren, "Albert," a homemade electronic analog computer. Dave's employers, Universal Oil Products Co., were so impressed by the machine's ability (it performs 10 mathematical operations simultaneously 60 times a second) that they persuaded him to allow Albert to enter company service. Only one of the many devices Dave has put together, the computer was constructed of war surplus equipment, like most of his contrivances. Not long ago a variation of temperature and humidity controls he had tested on his greenhouse turned up on a UOP Platforming unit of the Rock Island Refining Corp., making this the first refinery unit to be controlled entirely by electronics.

He also was the man largely responsible for designing the first refinery graphic panel, installed for Rock Island in 1949.

Dave was doing-it-himself years before the general public caught the craze. After his graduation from the University of Colorado in 1941 with a B.S. in chemical engineering, he went to work for Barret Chemical Co. in Philadelphia. During this period he built a TV set that worked so well he was transferred to the company's instrument department and began a career in control engineering.

Since Dave began with UOP in 1949, the products of his ingenuity have multiplied. A TV set, hi-fi equipment, and a variety of laborsavers compete for living space with his wife, two sons and daughter. Currently he is collaborating with one son on a 5-ft. steam locomotive designed to run on kerosene. It will power a miniature railroad to be built in Dave's backyard in suburban Chicago.

K. H. Rowland has been appointed assistant works manager of Carbide and Carbon Chemicals Co. and been transferred to the company's New York City headquarters from his former post as general superintendent of the South Charleston, W. Va., plant. He has been succeeded there by **Roland D. Glenn,** formerly plant superintendent in charge of resins and chemicals.

Mr. Rowland

Mr. Rowland joined the company in 1934 at the South Charleston plant. After a number of assignments at the plant he became, in 1952, superintendent of chemicals and resins and, in 1953, general superintendent.

Mr. Glenn came to the Carbide firm in 1934 after his graduation from M.I.T. with a M.S. in chemical engineering. He has been replaced as superintendent in charge of resins and chemicals by **Arthur P. Moss,** who was assistant superintendent in charge of chemicals production at the company's Institute, W. Va., plant. Mr. Moss has been with Carbide since 1933, having been graduated from North Carolina State College in 1932.

Frederick H. Belden has been appointed superintendent in charge of the South Charleston plant's gaseous raw materials, gas production, utilities, and office. He has been employed by the company since 1934. Prior to his latest promotion he was assistant superintendent at the Texas City plant.

Mr. Belden replaces **C. N. Rucker,** who has been appointed plant superintendent at the Torrance, Calif., plant. He joined the Carbide organization in 1933.

At Carbide's Institute plant **Henry B. Coons** and **L. N. Dickinson** have been appointed assistant superintendents in charge of chemicals production. Mr. Coons joined the company in 1933. Before his latest promotion he was area supervisor at South Charleston. Mr. Dickinson held the same post at the Institute plant. He has been with the company since 1933.

R. C. Hieronymus, formerly in charge of all raw materials and olefin production at the Texas City plant, has been appointed the plant's assistant superintendent in charge of all gas production and related units. Mr. Hieronymus joined Carbide in 1936 with a B.S. degree in civil engineering from the University of Illinois.

E. L. Baldeschwieler, Esso Research Center, Linden, N.J., was honored recently for his achievements as a chemist by the American Petroleum Institute Committee on Analytical Research. His work as a member and past chairman of the committee received particular mention in the citation, which was presented during a dinner at a New Orleans restaurant.

Mr. Baldeschwieler

Mr. Baldeschwieler came to the United States from his native Switzerland in 1907. While studying for a bachelor's degree in chemistry and a B.S. in mechanical engineering at Cooper Union in New York City, he worked at odd jobs, including that of a bottle washer for a pharmaceutical firm. In 1922 he was employed by the development depart-

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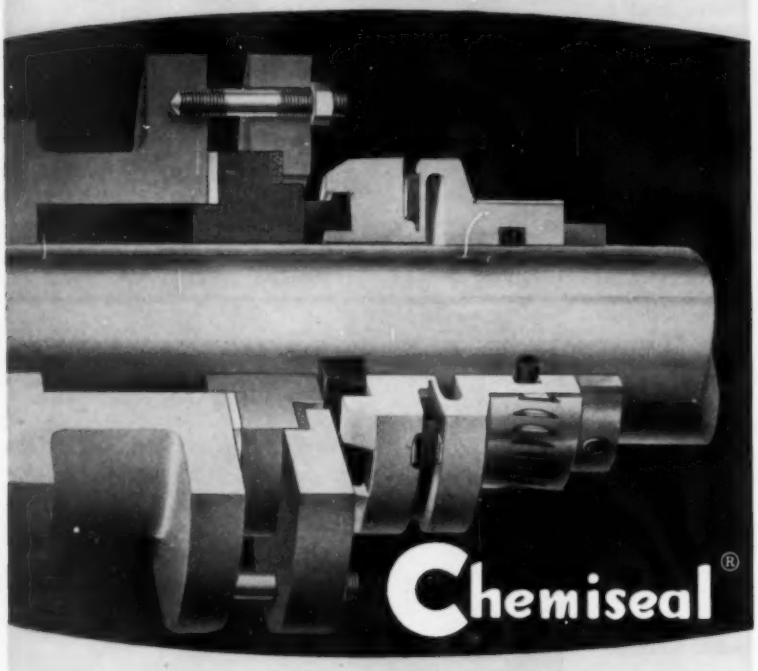

Chemically Impervious TEFLON Balanced Bellows Design

Three years of actual field tests have proven that Chemiseal external mechanical seals last longer and give unsurpassed performance under a wide variety of chemical service conditions—handling acids, alcohols, alkalies, hydrocarbons, and related chemical compounds including abrasive slurries and tarry material (with provisions for flushing).

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FEATURES

- **CHEMICALLY IMPERVIOUS** TEFLON Bellows section. A selection of seal face materials dependent upon medium and service requirements.
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ment of Standard Oil Co. (N.J.) as an analytical chemist. Today he directs the Research Center's analytical laboratories.

H. E. Hughes, chief engineer of Shell Chemical Corp.'s Houston plant, has been appointed to the plant's new post of assistant superintendent—technical. His job will be to establish a new engineering development department in the plant to deal with problems of plant construction, inspection and maintenance. The post also gives him administrative responsibility for the technological department and the plant laboratories.

Mr. Hughes began with Shell in 1934 at Pittsburg, Calif. He became assistant chief engineer at Houston in 1951 and chief engineer in 1953.

J. W. Hyde, formerly assistant chief engineer, has succeeded Mr. Hughes as chief engineer. **C. W. Delong,** of the company's head office construction group, has replaced Mr. Hyde.

Mr. Hyde joined the company in 1934 at Pittsburg, Calif. He became assistant chief engineer there in 1946 and the following year moved to Houston in the same capacity.

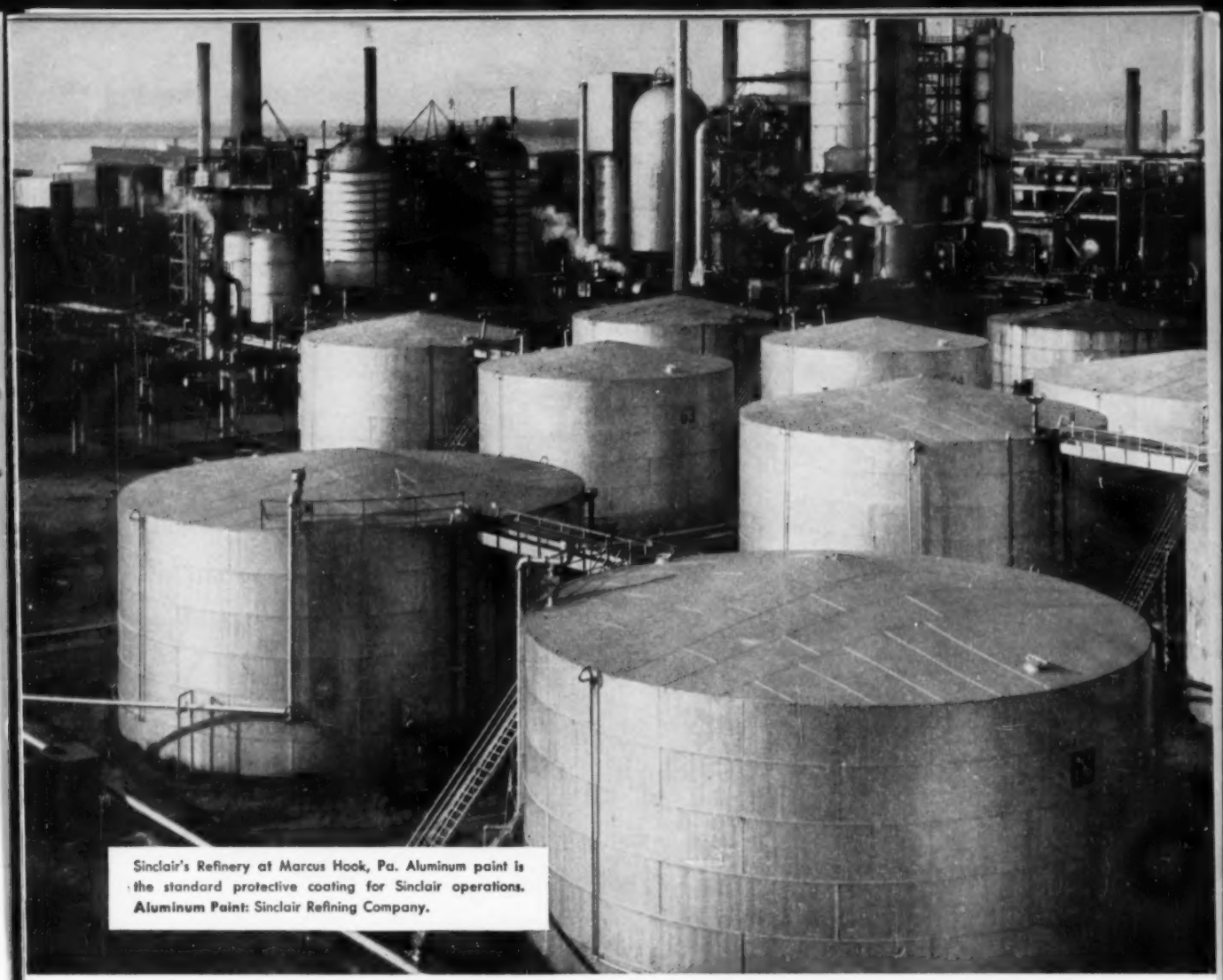
Mr. Delong was employed by Shell in 1943 as an engineer at Cactus, Texas. He was transferred to Houston the following year in the same job and became senior engineer in 1954.

S. R. McMurry has returned from special assignment in the Bartlesville office of Cities Service Oil Co. to Ponca City, Okla., where he has become manager of the refinery. He succeeds **D. R. McConnochie,** who has been transferred to the company's East Chicago, Ind., refinery on special assignment.

C. W. Rohler has been appointed chief process engineer at Ponca City, having been transferred from the process engineering section at Bartlesville.

A general reorganization of the manufacturing department's technical divisions has been carried out by Standard Oil of Ohio to accommodate expanded activities. **Dr. F. J. Sanders** has become engineering manager over the technical divisions. **H. F. West** continues as chief of the general engineering division; **E. N. Marsh,** formerly the technical service division's chief of process design, has been made chief of a new unit, the process engineering division.

Another new division, the process and products laboratory division, has **E. P. Kropp** as its chief. Mr. Kropp was formerly head of the technical



Sinclair's Refinery at Marcus Hook, Pa. Aluminum paint is the standard protective coating for Sinclair operations. **Aluminum Paint:** Sinclair Refining Company.

In corrosive coastal atmospheres

Aluminum Paint has lasted 15 years for Sinclair Refining Co.

Sinclair has used aluminum paint since 1916. Its unmatched performance through the years in protecting metal, reducing evaporation losses and improving appearance has made aluminum paint the standard protective coating for Sinclair's large refineries. Hundreds of bulk stations, terminals, tank farms and other installations throughout the country are similarly protected with aluminum paint.

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By the banks of the Wabash River at Robinson, Illinois, this new 8,330 barrel-per-day Houdriformer of the Ohio Oil Company is on stream, producing a high yield of superior quality gasoline from naphtha charge stocks. The new catalytic reforming unit is equipped with three catalytic reactors, a guard reactor and a three-stage heater.

Engineered and constructed by the Catalytic Construction Company, it was completed on schedule. The actual cost was below the original estimate.

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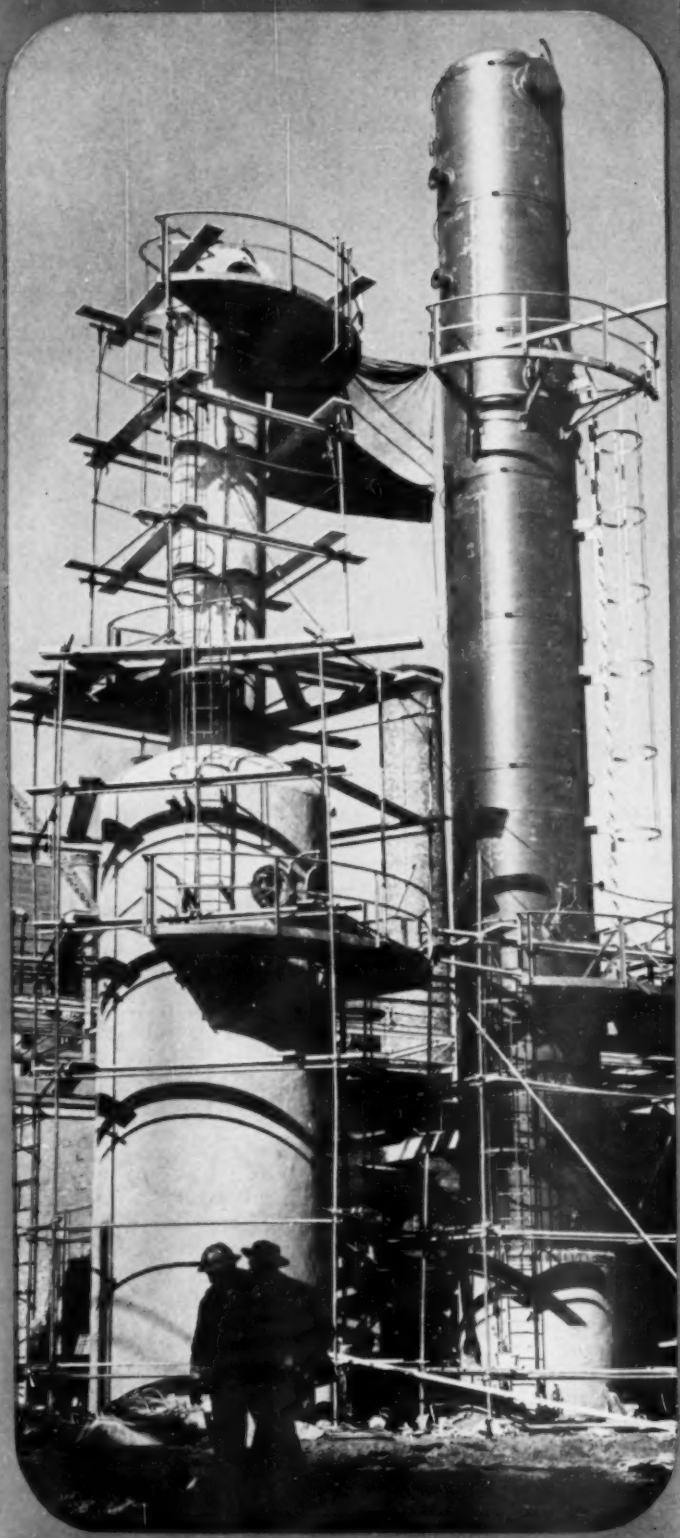

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service division's plant service section. This division will take over product service activities in liaison with the marketing department on all products except automotive fuels and lubricants.

Joseph August, who was assistant to the technical manager, has been made chief of the automotive engineering division, which replaces the fuels and lubes service division.

Three new positions reporting to the engineering manager have been created in this Sohio reorganization: **W. S. Schellentrager,** chief process engineer at the No. 1 refinery in Cleveland, has been made process engineering coordinator. **W. E. Scovill,** sectional supervisor in the process and development laboratory, has become product coordinator, and **R. I. Potter,** head of the now defunct fuels and lubes service division, has been designated automotive consultant.

Dr. Cameron H. Caesar has been appointed assistant manager of The Imperial Oil Co.'s research department. He was named chief research chemist in 1951, a job he held until his recent promotion.

G. W. Watts has been named director of engineering and engineering research of the general engineering department, a body set up in a recent reorganization of the manufacturing department of Standard Oil Co. (Ind.) The new engineering department serves all six of the company's refineries, without superseding the local engineering staff operating at each refinery under the plant manager. The general engineering department will confine itself to construction of major facilities and the coordination of engineering operations. Mr. Watts became director of engineering in 1945.

The chief engineer of the manufacturing department, **F. W. Scheineman,** has been appointed manager of the new general engineering department.

G. M. Keranen has been named the department's assistant manager for construction, coordination, and contracts, moving from his post of assistant chief engineer in manufacturing.

The new department's assistant manager for design engineering is **W. G. Guild,** who was assistant chief engineer in the manufacturing department at Whiting.

The final promotion on the engineering staff of the department is that of **C. E. Evans,** who has become the assistant manager for project engineering.

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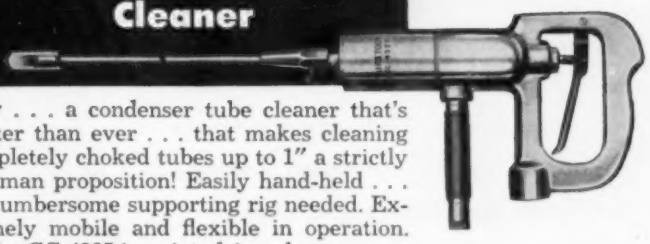

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The CC-4325 is quiet; driven by a powerful two-stage, muffled, air motor with a built-in flushing system that insures cooler running of the drill. A quick shut-off sleeve valve controls the flushing agent, and a trigger type valve controls motor speed. When used with a carbide tip drill, the CC-4325 makes short work of cleaning tubes completely choked with hardest deposits.

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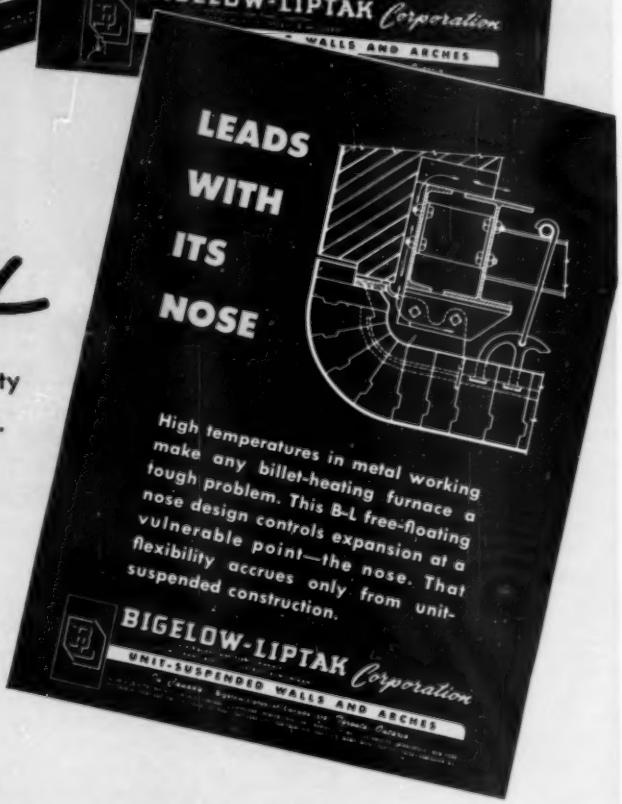
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Rockwell Sales Reorganized

The Meter and Valve Division of the Rockwell Manufacturing Co. has reorganized its entire midwestern sales set-up as a consequence of increased sales activity in that region.

Mr. Madison

The former regional manager, Carl K. Madison, has been promoted to vice-president in charge of new product sales for the entire division and the midwest district has been divided into two parts—southwestern and a smaller midwestern area.

Mr. Bush

Mr. McLaughlin

Roy R. Bush, district manager at Tulsa, Okla., has been named manager of the midwestern region, with headquarters at Tulsa. W. R. McLaughlin, manager of the Dallas office, has been made southwestern regional manager, with headquarters at Dallas.

Lunkenheimer to Consolidate

Consolidation and expansion plans of the Lunkenheimer Co., valve manufacturers, call for greatly increased activity at the company's Fairmount plant, Cincinnati, Ohio.

To complement this plant's production of bronze valves, the company will erect a modern factory on recently acquired land adjacent to the Fairmount site and center there its production of iron and steel valve machining operations. The new development will provide space for any future expansion and will include greatly enlarged parking facilities.

TEL Transfer Terminal Opens

A new tetraethyl lead transfer terminal near Ferndale, Wash., was put into operation recently by the Du Pont Co. The terminal was installed to facilitate tank truck delivery of tetraethyl lead to General Petroleum's new Ferndale refinery. Moreover, it makes possible regularly scheduled or emergency spot shipments to other customers in the Pacific Northwest by tank truck or by tank car.

Rich Opens Consulting Offices

Engineering and consulting work for the chemical and petroleum industries is offered by Wilson C. Rich, Jr., formerly of the Standard Oil Development Co. He was with SOD from 1946 until recently, and during the last four years was engaged in the development of Fluid hydroforming.

Following his graduation with a B.E. degree from Yale University in 1942, Mr. Rich worked with Carbide and Carbon Chemicals Corp. for four years in both synthetic resins and butadiene production.

Mr. Rich has his offices at 294 Old Tote Rd., Mountainside, N. J.

Hartough Takes Houdry Section

Howard D. Hartough has been assigned to carry out research on new petrochemicals and catalysts at the Marcus Hook, Pa., laboratories of the Houdry Process Corp. Mr. Hartough is an authority on the chemistry of thiophene, having written the only books in English on the subject. He has been the author of 30 publications, two-thirds of them on thiophene, and holds 70 patents.

Mr. Hartough

After receiving his B.A. degree from Hope College, Holland, Mich., Mr. Hartough won a 2-yr. teaching fellowship at George Washington University and was awarded a master's degree in 1938. He then joined the Socony-Vacuum Laboratories, Paulsboro, N.J., and worked with petrochemicals and the development of thiophene for the next 13 years. In 1951 he transferred to Hercules Powder Co., where he was engaged in market development of petrochemicals until joining the Houdry firm.

Austin Opens Brazilian Affiliate

Coordinated design and building service will be offered to American firms operating in Brazil by a new affiliate of the Austin Co., an industrial building firm with headquarters in Cleveland. The new company will be known as the Companhia Austin—Engenheiros e Constructores, and will have its headquarters in Sao Paulo. Its president will be Cyril F. Prideaux, who has been with Austin since 1941.

The Austin firm has given engineering and construction service to firms working in Latin America in petroleum, rubber, pharmaceutical and other industries.

K & H Forms Wastes Division

The growing importance of special facilities for disposition and treatment of waste materials has been recognized by Kaighin & Hughes, Inc., piping and mechanical contractors, with the organization of an industrial wastes division in the firm. Edmund B. Besselievre, formerly chief sanitary engineer of the Dorr Co.'s international division, has become the division's manager.

Mr. Besselievre

Mr. Besselievre is credited with having handled sanitary engineering projects in 63 countries over the world during a period of 30 years. He is the author of the book "Industrial Waste Treatment," published in 1952, and of more than 75 technical articles on various topics of sanitary engineering.

With the organization of the new division, Kaighin & Hughes is equipped to provide design, engineering and contracting to solve waste materials problems.

Pressed Steel Car Changes Name

The diversification of activities in recent years beyond the scope implied by the name Pressed Steel Car Co., Inc., has caused the company to discard its old title in favor of U. S. Industries, Inc.

Chiefly a manufacturer of all-steel freight cars for over 50 years, the company began to enter other fields six years ago. Beginning in 1948, purchases of steel fabricating companies led the firm into manufacture of steel cookware, dairy cans, waste receptacles, steel tanks for industrial and residential use, and electric conduit fittings. When the company acquired the assets of the Axelson Manufacturing Co. of Los Angeles and St. Louis in 1952 it began to turn out petroleum

No. 2* of . . .

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pumping equipment, heavy duty engine lathes, and aircraft components.

A major step toward diversification was taken last October when the company bought the assets of the Clearing Machine Corp., Chicago, and entered the field of manufacturing mechanical and hydraulic presses for the metal-forming industry.

Concurrent with these moves was the decline of the freight car business, which accounted for less than one-third of the company's sales in 1953. Early in 1954 Pressed Steel closed its last freight car building plant at Mt. Vernon, Ill.

Personnel Changes

Garlock Packing Co.—J. B. Sewell to general sales manager, with headquarters at Palmyra.

Davison Chemical Co. — Roy L. Goltz to New York district manager for petroleum catalysts.

Monsanto Chemical Co.—Desmond B. Hosmer to manager of the Anniston, Ala., plant, succeeding Wallace K. Belin, who will become production manager of a plant now under construction at Kearny, N.J.; W. Kenneth Conwell to assistant district manager at Houston; Donald E. Marriner to the Wilmington, Del., sales office. All but Mr. Belin are in the organic chemicals division.

Enjay Co., Inc.—P. L. Richards to assistant sales manager of the alcohol and chemical division; G. M. Herbert to assistant manager of the paramins division.

Tellepsen Petro-Chem Constructors—Stafford H. Wilde to division sales manager.

Rust Engineering Co. — James A. Slater to sales engineer.

International Nickel Co., Inc.—C. T. Haller, Jr., to chief of the Pittsburgh, Pa., technical field section of the development and research division.

National Aluminate Corp.—Bruce C. Kirtley, from M. W. Kellogg Co. to catalyst division in a technical sales capacity, with headquarters in Houston.

Calumet & Hecla, Inc.—Harry L. Simcox to sales representative in the east central district, with headquarters in Columbus, Ohio; J. H. Smith to sales manager of east central district. Both are in Wolverine Tube Division.

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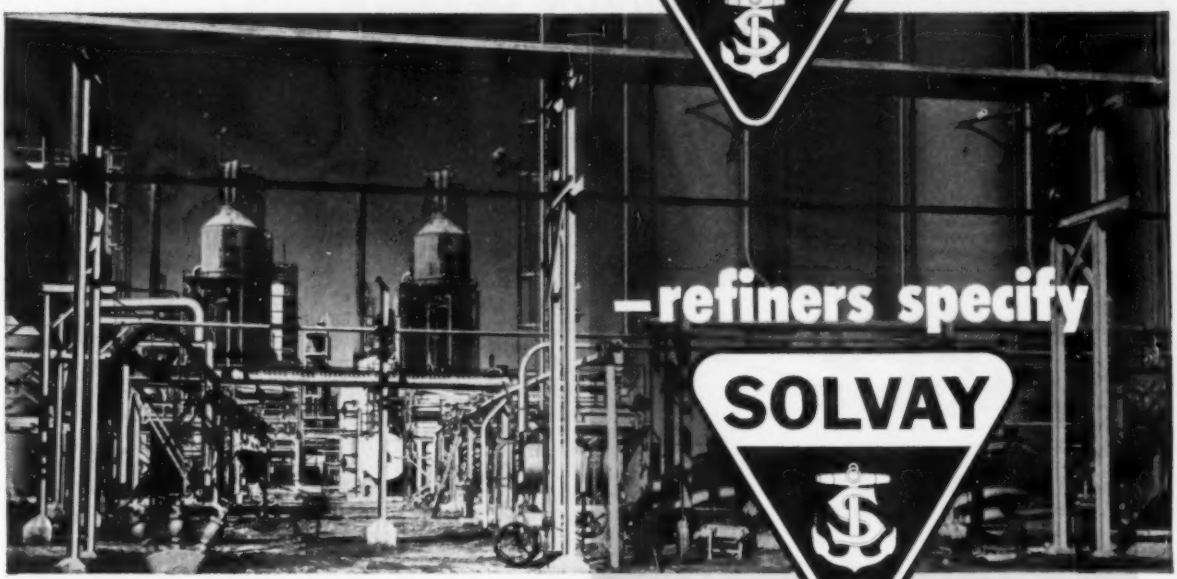

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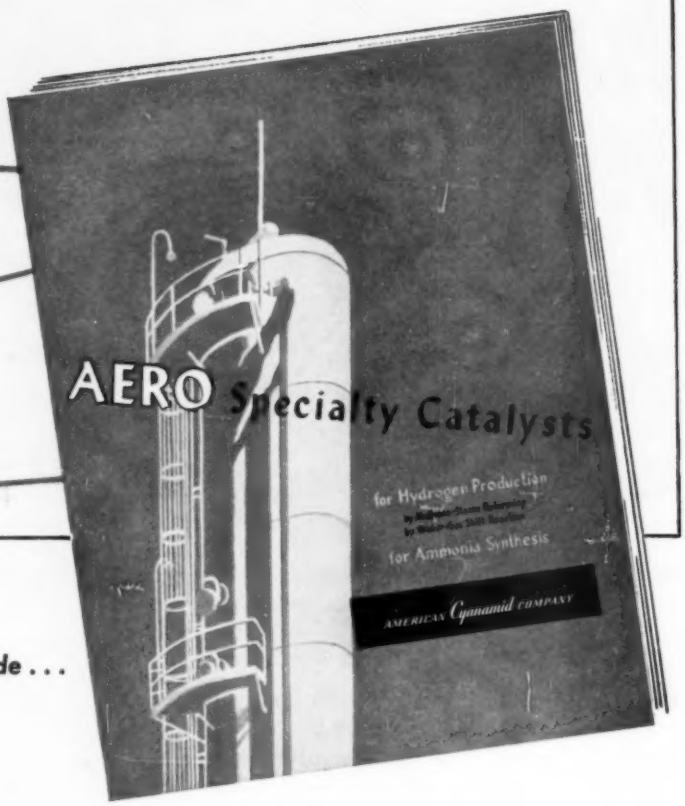

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Foster D. Snell, Inc.—J. G. Detwiler to the staff as a petroleum consultant.

Cooper Alloy Corp.—Robert Lee Weidman to technical sales representative in the mid-Atlantic states; Peter Gasperini to sales department of the valve and fitting division.

Turbine Equipment Co. — Harold Sinclair, from president to chairman of the board; Donald F. Miller, from executive vice-president to president; Paul E. Linthwaite, from sales engineer to vice-president of machinery sales.

Witco Chemical Co.—W. F. George, from district sales manager for Hooker Electrochemical Co. to special assistant to the Witco president.

Refinery Engineering Co.—Donald F. Ferguson to process department as a process engineer.

General Electric Co.—Rudolf Torbico to Carboloy Department as field sales representative.

Fritz W. Glitsch & Sons—Nat Nesbitt to the Dallas sales office.

M. W. Kellogg Co.—John M. McAneny to manager of the sales administration department; Dr. Charles H. Leigh, recently of Brookhaven National Laboratory, to the catalysis section of the Jersey City, N.J., research laboratory; Roger Maurice Serre to the staff of senior sales representatives, operating in the petroleum and petrochemical fields.

Industrial Models, Inc. (Ohio)—J. R. Rowland, Jr., to vice-president of sales, with headquarters in Cleveland.

Burgess-Manning Co.—S. G. Paddock to Dallas division manager and director of the newly organized national sales organization; Frank K. Becker to manager of the Dallas district, with H. L. Harris as assistant in sales; H. A. Dietrich to manager of the Chicago district, with F. C. Duerr as assistant in district sales; W. A. Carroll, Jr., to manager of the New York district, with assistance in sales from R. T. Oliver, Jr.

Du Pont Co. — Wesley T. Dorsheimer to assistant manager of the eastern region, succeeding Barry V. Cornwall, who has been transferred to assistant manager of the Gulf Coast region. Both men are part of the petroleum chemicals division.

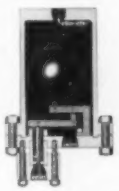
there's a RIGHT way to trap a Steam Line!

JUST SPECIFY Clark CONTROLS

Thanks to the proven dependability and completeness of the Clark steam trap and regulator lines, power engineers can meet most of their requirements simply by calling a Clark representative. For there's a "right" Clark steam trap for every purpose.

Clark makes the famous patented Duo-Step inverted bucket traps that handle *double* the usual amount of condensate. In addition, Clark manufactures open bucket and float type traps as well as pressure regulators and strainers.

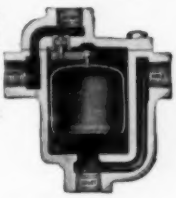
So call on Clark for *all* fluid control requirements. There are Clark representatives in most major cities.



SERIES "450" FLOAT TRAP. For drainage where continuous flow is desired, or for maintaining liquid levels. Steel construction for pressures to 600 P.S.I. Compound linkage gives larger capacity. Size ½" to 2".

SERIES "80"-D (DUO-STEP) TRAPS. Cast semi-steel construction for pressures up to 250 P.S.I. and temperatures to 450°F. Equipped with Duo-Step Leverage and Venting, Clark-loy seats and discs. Pipe sizes from ½" to 2".

"Y" SELF-CLEANING STRAINERS. Remove dirt, scale and grit from steam, fluid and gas lines. Sizes ½" to 3" I.P.S.



SERIES "60" INVERTED BUCKET TRAP. Choice of horizontal or vertical inlet or outlet. For pressures up to 150 P.S.I. "Clark-loy" guided disc and seat.

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THE VALVE THAT CONQUERS *FLASHING* CONDENSATES

Better Control, with Lower Initial and Maintenance Costs

Use Annin valves for better control of steam and condensates to 2500 PSI and 900° F *without* use of hard-to-maintain special assemblies. Flanged seat ring eliminates seal welding. Body construction eliminates liners and reduces down stream piping erosion. Available with manual, cylinder or Domotor automatic operators. Single seat provides bubble-tight shut-off. For better control, longer life, and lower maintenance use ANNIN CONTROL VALVES.

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You'll profit by learning more about the superior features and better performance of Annin Control Valves.

Air Pollution Featured at SAE Meeting

Smog authorities from Los Angeles County, California, will take their arguments to the heart of the automobile industry when they appear on the air pollution symposium at the Society of Automotive Engineers' annual meeting January 10 to 14 in Detroit. The SAE will celebrate its golden anniversary on this occasion and has several special features planned to commemorate the event. The meeting will be held at three locations in Detroit: the Sheraton-Cadillac Hotel, the Hotel Statler, and the Detroit Masonic Temple.

The tentative program for the air pollution symposium, scheduled for the morning of January 10, has G. P. Larson, Air Pollution Control District, Los Angeles County, opening the meeting with an address, "A Study of the Distribution and Effects of Automotive Gases in Los Angeles."

Automobile exhaust and ozone formation will be examined by A. J. Haagen-Smit, California Institute of Technology, and Margaret M. Fox, Air Pollution Control District. D. H. Hutchison and F. R. Holden, of Stanford Research Institute, will present an inventory of automobile exhaust gases, and W. L. Faith, Southern California Air Pollution Foundation, will talk about "SCAPF—What It Is and What It Does."

Next, F. G. Rounds, P. A. Bennett, and G. J. Nebel, General Motors research laboratories, are scheduled to present the paper, "Some Effects of Engine-Fuel Variables on Exhaust Gas Hydrocarbon Concentration." The final offering at the symposium will be "Flame Photographs of Light Load Combustion Point the Way to Reduction of Hydrocarbons in Exhaust Gas," by J. T. Wentworth and W. A. Daniel, General Motors laboratories.

On Tuesday morning, January 11, three papers are tentatively scheduled on the topic of fuels and lubricants: "The Control of Low Temperature Sludge," by R. L. Willis and E. C. Ballard, the du Pont Co.; "Effect of Fuel and Lubricant Volatility on Engine Octane Requirements," by N. V. Hakala, L. E. Moody, and R. W. Scott, Standard Oil Development Co.; and "Abrasive Wear of Piston Rings," by C. E. Watson, F. J. Hanly, and R. W. Burchell, California Research Corp.

Refiners Plan 50 Talks For St. Louis Meeting

Refiners planning to attend the 20th Mid-Year meeting of the Division of Refining, American Petroleum Institute, can look forward to a very full program comprising 50 technical papers presented during 13 half-day sessions (including two evening sessions). The affair will be held at the Jefferson Hotel, St. Louis, Mo., May 9-12, 1955.

Although the exact titles of papers and authors have not yet been announced, tentative arrangements have been completed on the subjects for the various sessions. Details of these arrangements are as follows, including the names of men who are developing each session.

Monday, May 9—Two sessions on analytical research (16 papers), C. E. Headington and G. R. Lake. One session on corrosion (four papers), C. F. Pogocar. One session on training (three papers), E. R. Laminack.

Tuesday, May 10—One session on smoke and fumes (three papers), Vance N. Jenkins. One session on product control (three papers), W. K. Bergen. One session on pressure vessels (two papers), N. J. Rees.

Wednesday, May 11—Two sessions on processes (nine papers), C. L. Thomas. One session on fuels and lubricants (three papers), T. B. Rendel. An open dinner meeting, C. E. Davis.

Thursday, May 12—One session on refinery maintenance (three papers), D. R. Johnson. One session on petroleum products (four papers), P. C. White.

AIChE Meeting to Discuss New Refinery Techniques

Extraction and absorption, chemical engineering operations widely used in the oil and gas industry, will share top billing with a session on fluid and moving-bed processes at the annual meeting of the American Institute of Chemical Engineers, to be held at the Hotel Statler in New York, December 12 to 15.

Standard Oil Development Co. will take the wraps off its new fluidized char adsorption (FCA) process in a paper to be presented on the morning of December 15. At the same session, J. C. Richards, of M. W. Kellogg Co., will describe fluid hydroforming, while Clyde Berg, Union Oil Co., will discuss the design of process systems using moving beds.

Morning and afternoon meetings on December 14 will cover the latest developments in liquid-liquid extraction processes and equipment. Speakers will represent Shell, Esso, Sinclair and Stone & Webster, as well as New York University, Penn State, Carnegie Tech, Virginia Polytechnic and University of Birmingham (England).

Liquid ammonia as an extraction solvent for petroleum fractions has been studied by Penn State's petroleum refining laboratory. M. R. Fenske and co-workers will report the results obtained with a 20-stage countercurrent extractor, arranged with both stripping and enriching zones. They will discuss the need for controlling the dissolving power of the ammonia solvent with water or methylamine.

J. R. Felix and C. H. Holder, of Esso Laboratories, will discuss efficiency and capacity factors in lube extraction. Although their work was based on phenol extraction of lubes, they believe that the principles they have evolved apply in other extraction processes as well.

At the gas absorption symposium on the afternoon of December 13, emphasis will be on absorption operations involving chemical reaction.

Petrochemical operations, too, figure prominently on the program for the A.I.Ch.E. meeting. C. R. Nelson and M. L. Courter will describe Shell's process for direct hydration of ethylene to make ethyl alcohol. In a symposium on reaction kinetics, several papers will cover such processes as dehydration of tertiary butyl alcohol, methane-steam reaction and hydration of propylene oxide.

Oil Man's Calendar

DECEMBER

American Institute of Chemical Engineers, annual meeting, New York, Dec. 12-15.

Fourth Conference on Scientific Manpower, sponsored by the National Science Foundation, et al, Berkeley, Calif., December 28-29, 1954.

JANUARY

Society of Automotive Engineers, annual meeting, Hotel Statler, Sheraton-Cadillac Hotel, Detroit, Mich., January 10-14, 1955.

Plant Maintenance and Engineering Show, International Amphitheatre, Chicago, January 24 to 27, 1955.

Instrumentation for the Process Industries, Chemical Engineering Department of Texas A. & M. College, College Station, Texas, January 26-28, 1955.

Symposium on Hydrocarbon Chemistry, Southeastern Texas Section, American Chemical Society, Houston, Texas, January 27-28, 1955.

Fourth Annual Instrument Short Course, sponsored by the Southern California Meter Association, Los Angeles Harbor Junior College, Wilmington, Calif., January 27 and 28, 1955.

Information Offered in the Advertisements

Do you need detailed information on a specific subject? Check through this easy-to-use index of literature and data being offered in this issue's advertisements.

ADDITIVE, lube oil, samples and information; Du Pont Co. See adv't. p. 1904.

BLENDING EQUIPMENT, automatic batching, descriptive literature; Proportioneers. See adv't. cover 2.

BORON FLUORIDE for many catalyst uses; Baker & Adamson Products; Gen'l. Div., Allied Chemical & Dye Corp. See adv't. cover 3.

CATALYST for reforming, brochure "Catforming;" Atlantic Refining Co. See adv't. p. 1838.

CATALYST, synthetic, descriptive folder; Davison Chemical Co. See adv't. p. 1907.

CATALYSTS, many types, bulletin available; Girdler Corp. See adv't. p. 1832.

CATALYTIC CRACKING, "Houdriflow," brochure and flow diagrams; Houdry Process Corp. See adv't. p. 1841.

CLAD STEEL for refinery fabrications, color movie; Lukens Steel Co. See adv't. p. 1826.

CLEANING AGENTS for general maintenance, booklet F 7629R; Oakite Products, Inc. See adv't. p. 1941.

CORROSION INHIBITOR, "Polyrad," a filming amine inhibitor, brochure; Hercules Powder Co. See adv't. p. 1839.

CYLINDERS, stainless steel, for pressure sampling, information available; Hoke, Inc. See adv't. p. 1935.

DRYING EQUIPMENT, air and gas, desiccant type, booklet; Pittsburgh Lectrodryer Corp. See adv't. p. 1843.

FIRE PROTECTION, complete plant systems, foam type, new booklet; National Foam System, Inc. See adv't. p. 1853.

FITTINGS, welding flanges, alloy steel, bulletin K-1; Key Co. See adv't. p. 1943.

FLANGES, drop-forged, wide range of sizes and styles, brochure; Phoenix Mfg. Co. See adv't. p. 1935.

FLOATING ROOFS, double pontoon, manual WP-14, Gen'l Amer. Trans. Corp. See adv't. p. 1818.

FLOW MEASUREMENT, automatic batching with "Fluidometer," bulletin FI-49; Hetherington & Berner, Inc. See adv't. p. 1937.

GAGES, liquid level, convex scale, data on request; Jerguson Gage & Valve Co. See adv't. p. 1930.

HEAT EXCHANGERS, evaporative cooling, bulletins 120 and 124; Niagara Blower Co. See adv't. p. 1938.

HEAT EXCHANGERS, all types, new booklet available; M. W. Kellogg Co. See adv't. p. 1923.

MIST ELIMINATORS, wire mesh type, catalog; Metal Textile Corp. See adv't. p. 1852.

MIXERS, side and top entering, nine bulletins describe complete line; Mixing Equipment Co. See adv't. p. 1866.

MOTOR STARTERS, for hazardous locations, booklet 1062; Electric-Controller & Mfg. Co. See adv't. p. 1848.

OVENS, for laboratory use, constant temperature, catalog 331-A; Precision Scientific Co. See adv't. p. 1865.

PAINT, aluminum, for atmospheric corrosion control, booklet; Aluminum Co. of Amer. See adv't. p. 1911.

PIPE, fittings and valves, "Saran-Lined," corrosion resistant, catalog; Saran Lined Pipe Co. See adv't. p. 1830.

PIPE CATTER, hinged, for steel and cast iron pipe, literature; Reed Mfg. Co. See adv't. p. 1937.

PRESSURE GAGE, control and indication, direct setting, bulletin 110; Hammel-Dahl Co. See adv't. p. 1900.

PUMPS, non-clogging, for sludges and slurries, bulletin 206-4; Lawrence Pumps, Inc. See adv't. p. 1929.

SCALE MODELS, refinery and industrial construction, brochure; Industrial Models, Inc. See adv't. p. 1902.

SHAFT SEAL, "Teflon," corrosion resistant, bulletin MS-954; U. S. Gasket Co. See adv't. p. 1910.

TANK GAUGE, electronic, accurate, information; Gilbert & Barker Mfg. Co. See adv't. p. 1944.

TRAPS, ball float, air, steam, bulletin 289; Armstrong Machine Works. See adv't. p. 1939.

TUBE CLEANING, equipment, lightweight, details on request; Airetool Mfg. Co. See adv't. p. 1913.

TUBES, heat exchanger and condenser, various metals, new books; Wolverine Tube. See Adv't. pp. 1844-1845.

TURBINES, constant pressure for boiler feedwater, catalog 500; Dean Hill Pump Co. See adv't. p. 1840.

VALVES, motor driven, control, catalog LB-1; Conoflow Corp. See adv't. p. 1847.

VALVES, lubricated plug, catalog; Homestead Valve Mfg. Co. See adv't. p. 1916.

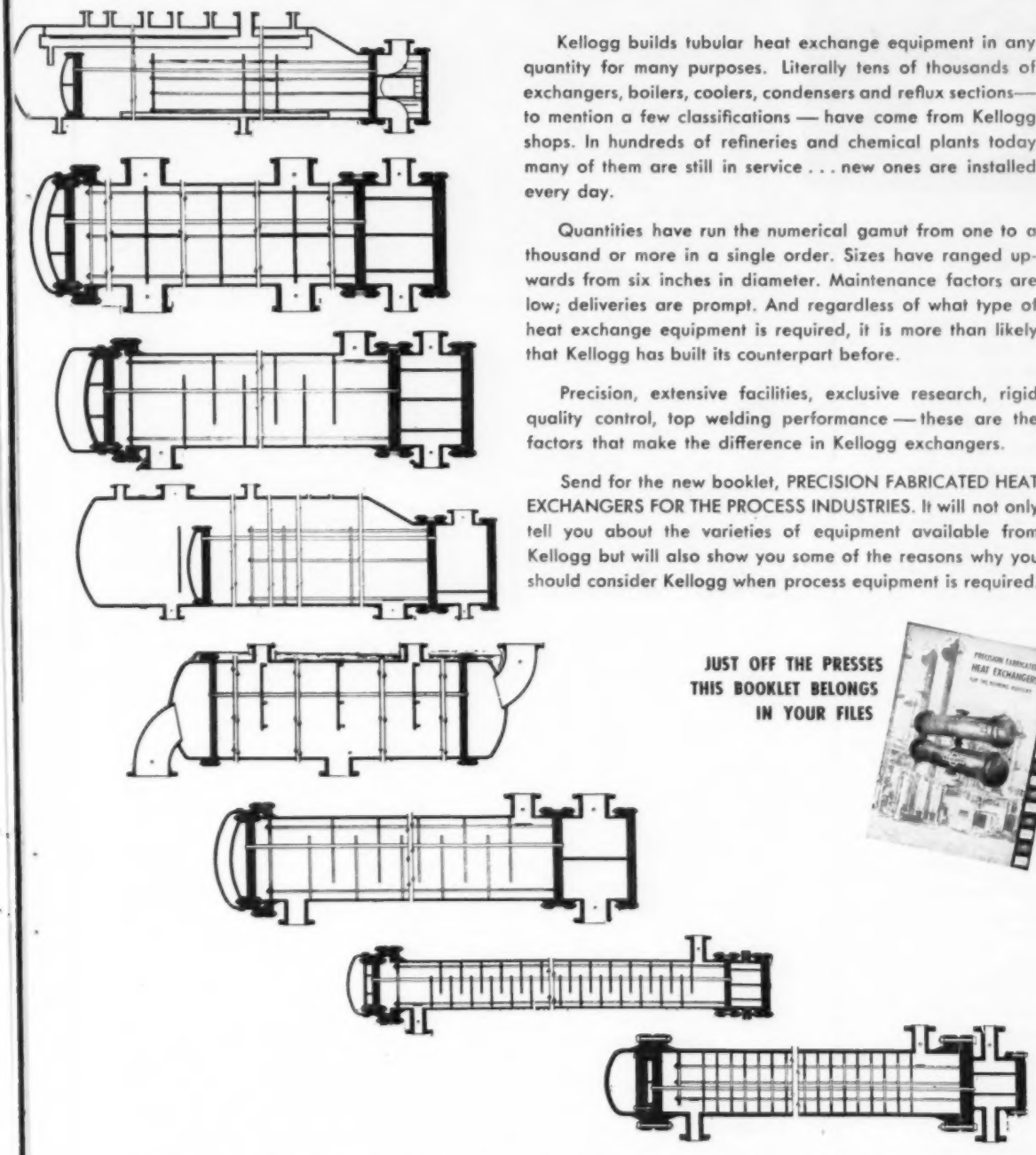
VALVES, venturi type, flanged end, literature; Orbit Valve Co. See adv't. p. 1859.

VALVE ACTUATORS and positioners, bulletin E-3500; Fisher Governor Co. See adv't. p. 1854.

VALVE POSITIONERS, for dampers and slide valves, bulletin 1-86; Askania Regulator Co. See adv't. p. 1942.

HEAT EXCHANGERS

...a wide variety in any quantity!



Kellogg builds tubular heat exchange equipment in any quantity for many purposes. Literally tens of thousands of exchangers, boilers, coolers, condensers and reflux sections—to mention a few classifications — have come from Kellogg shops. In hundreds of refineries and chemical plants today many of them are still in service . . . new ones are installed every day.

Quantities have run the numerical gamut from one to a thousand or more in a single order. Sizes have ranged upwards from six inches in diameter. Maintenance factors are low; deliveries are prompt. And regardless of what type of heat exchange equipment is required, it is more than likely that Kellogg has built its counterpart before.

Precision, extensive facilities, exclusive research, rigid quality control, top welding performance — these are the factors that make the difference in Kellogg exchangers.

Send for the new booklet, PRECISION FABRICATED HEAT EXCHANGERS FOR THE PROCESS INDUSTRIES. It will not only tell you about the varieties of equipment available from Kellogg but will also show you some of the reasons why you should consider Kellogg when process equipment is required.

JUST OFF THE PRESSES THIS BOOKLET BELONGS IN YOUR FILES

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KELLOGG
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225 Broadway, New York 7, N. Y.

In Canada—**The Canadian Kellogg Company, Limited, at Toronto and Edmonton**

In Europe—**Kellogg International Corporation, at London**

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Each advertiser listed in this index has been assigned a code letter for use by the reader in securing additional information about advertised products or services which interest him. This code letter appears in parentheses to the left of the advertiser's name.

•

Circle the code letter on the "Advertised Product Inquiry" card (on the page opposite) which corresponds to that assigned the advertiser about whose product you want further information.

Fill in your name, title, company and mailing address and mail the card . . . no postage is required.

The Petroleum Processing Reader Service Department will give your inquiries prompt and efficient handling.

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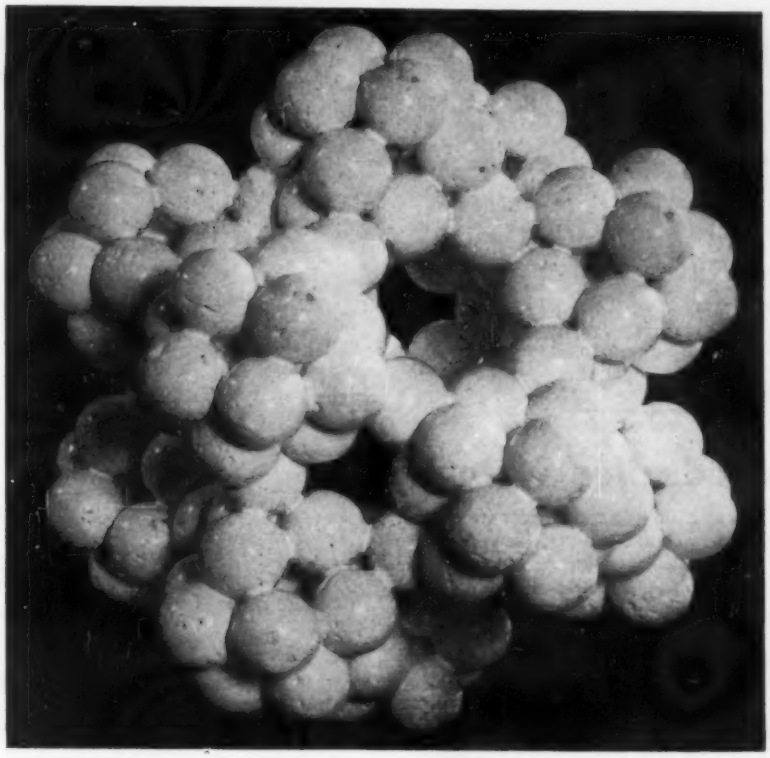
WHAT'S NEW . . .



A New Approach to Adsorption

"Molecular Sieves," a model of one of which is shown in the illustration above, are a new product development with promise of providing a significant progress step in the use of adsorption as a processing technique. Chemically, they are synthetic zeolites, similar to many natural clays and feldspars. Physically, they are adsorbents which will separate liquids and gaseous materials on the basis of differences in molecular size.

They are made of atoms of sodium or calcium aluminum silicate, arranged in a definite crystalline formation. This structure contains a large number of cavities, interconnected by a number of still smaller holes, or pores. Both cavities and holes are very uniform in size and measurable. During manufacture the water of hydration is driven off, and the crystals retain their form and structure. Straight chain hydrocarbon molecules, having smaller diameters than branched chain molecules, will enter the "sieve" and be trapped, while the larger branched chain molecules cannot enter and pass on with the process stream. Thus, mixtures of compounds with the same boiling points, for example, can be separated (impossible in the case of fractionation).

Typical applications foreseen for the material include: hydrocarbon separation, recovering unsaturates from waste gas streams, gas purification, liquid and gas drying at elevated or normal temperatures, and many others. Linde Air Products Co., 30 East 42nd St., New York 17, N. Y.

Circle No. **1** *on Reply Card*

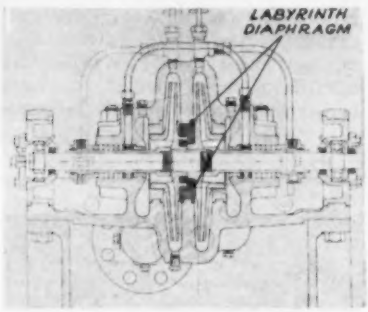
For More Information

Use one of the attached reply cards to request additional details or literature on any items reviewed in "What's New!" Just circle the number corresponding to the number at the end of each item in which you are interested. Then fill in the rest of the card and drop it in the mail. No postage is required.

New X-Ray Spectrophotometer Analyzes 12-Element Samples

. . . giving percentage compositions. The "Autrometer" allows automatic multi-element indexing over 71 elements in the periodic table. The machine uses either a scintillation counter or a proportional counter for detection, as required by the work. A split-beam shutter makes it possible to compare intensities of the specimen with the standard. Readout is a three-digit number registered on an automatic printer. The X-ray tube is shockproofed, water-cooled and completely enclosed. Twelve program selectors provide indexing positions in which percentages of any one of twelve elements will be indicated in sequential order. Optional equipment includes a vacuum pump for X-ray tube evacuation where air absorption must be minimized, and facilities for providing hydrogen, helium or other gas atmospheres. North American Philips Co., Inc., 750 South Fulton Ave., Mount Vernon, N.Y.

Circle No. **2** *on Reply Card*



Two-Stage Centrifugal Pump Has Labyrinth Diaphragm

. . . for handling clear liquids. The "Fig. 3305" line of pumps has opposed impellers to insure hydraulic balance and the labyrinth diaphragm for thrust balance. The casing is horizontally split. The interior can be inspected and the rotating parts removed and replaced without disturbing the pipe connections. Short bearing spans afford installation space savings. A maximum of interchangeability between the five pump sizes reduces spare parts inventory. Pump rotational direction can be reversed in the field without additional parts. Conventional stuffing boxes or mechanical seals are available. The pumps have heads up to 1000 ft. and capacities up to 1000 gpm. Dept. OP, Goulds Pumps, Inc., Seneca Falls, N.Y.

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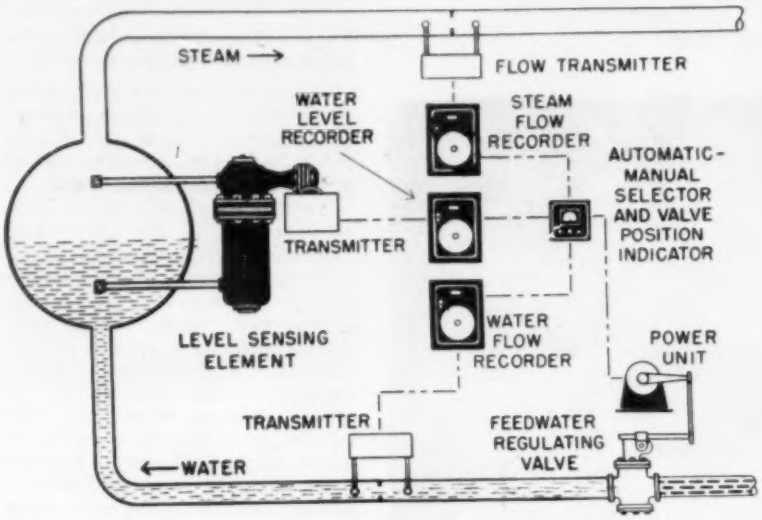
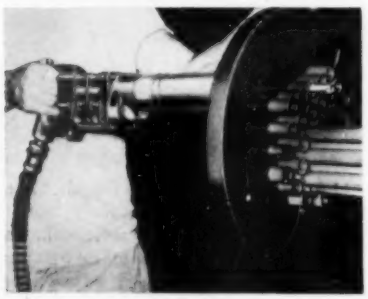


Electronics Control Feedwater System

A new multiple-element (up to three variables) uses electronics for high speed and accurate control independent of normal variations in voltage or frequency. Shown in the drawing is a three-element system, comprising level sensing, steam flow and water flow measurement. Three systems are offered for large, medium or small boilers under all conditions. Pressures up to 2500 psig can be accommodated. Features include a positive valve drive which will not freeze; operative on cold boilers; direct level measurement; electronic null balance remote operation; independent adjustments for effects of steam flow, water flow and water level; and no blow-down necessary. The Hays Corp., Michigan City, Ind.

Circle No. **4** *on Reply Card*



Internal Tube Cutter Is Lightweight and Fast

. . . and will cut steel and non-ferrous condenser tubes from 5/8 in. to 1 in. O.D., through tube sheets 1 in. to 4 in. thick. The "Internal Tube Cutter" is made of heat treated alloy steel with easily replaced tool steel double cutters. It cuts the tube behind the tube sheet. The cutting tool is self-centering and double-action with two cutters. Power is by an air-driven motor. The Aire-tool Mfg. Co., 304 S. Center St., Springfield, Ohio

Circle No. **5** *on Reply Card*

Laboratory Mixing Paddle Fits into Narrow Inlets

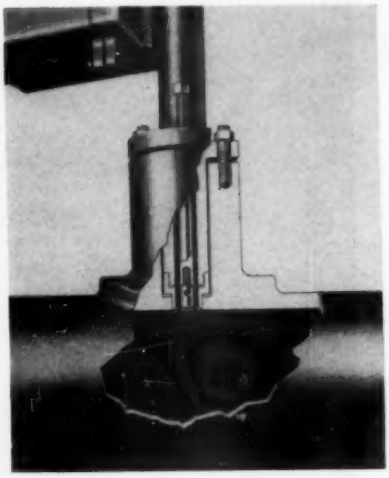
. . . not less than ⅝ in. diameter. The "Flexistir" is a stainless steel rod with a flexible stainless steel chain paddle for general stirring in erlenmeyer or boiling flasks, or any other narrow-mouthed containers such as test-tubes. The mixer comes in 2 standard sizes of 10 in. by ¼ in. and 12 in. by 5/16 in., or can be made to exact specifications. Palo Laboratory Supplies, Inc., 81 Reade St., New York 7, N.Y.

Circle No. **6** *on Reply Card*

Porous Teflon Filter Medium Resists Corrosion and Heat

. . . and is made by a sintering-molding process without additives or plasticizers. With a mean pore size of 9 microns, it will filter particles having diameters larger than 3 microns from liquids. In gas filtration, one micron particles are removed. Flow capacity through the filter is 45 gal./min./sq. ft. of filter at 5 psi differential pressure for organic fluids of 1 cp viscosity. It is suitable for use with all commercial acids, caustic and organic solvents, including fuming nitric acid, aqua regia, and hydrogen peroxide. After use, the filter can be chemically cleaned and sterilized. It is non-absorbent, shows no loss of strength when wet, and can be used for temperatures up to 450° F. Disc sizes up to 12 in. diameters are available. Porous Plastic Filter Co., Glen Cove, N.Y.

Circle No. **7** *on Reply Card*



New Pressure Transmitter Has No Stagnant Pressure Lines

. . . and can measure up to 2500 psig at 300° C. The "P3T Flush Diaphragm" pressure transmitter has the measuring diaphragm mounted in a well with the diaphragm surface flush with the pipe wall inside. All parts in contact with fluids are made from stainless steel. In operation, pressure changes cause small movements of the diaphragm which are transmitted through a rod to a mechanical linkage which in turn actuates to the core of a differential transformer. The resulting output signal varies from 0.000 to 0.500 volts, and is directly proportional to the measured pressure. Air lines, slide wires, electric motors, and vacuum tubes are eliminated. The transmitter is continuously adjustable and can be used with recorders in pressure ranges of 0-200 to 0-1000 psig and 0-1000 to 0-2500 psig. Sensitivity is claimed better than 0.005%, reproducibility 0.1%, and accuracy 1.0%. Process fluid temperature change effects on readings are low. The Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio

Circle No. **8** *on Reply Card*

Only the Wiggins Gasholder*

has the dry fabric seal that

eliminates maintenance problems!

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135 South La Salle Street
Chicago 90, Illinois

Thermocouples Made Easily With Small Laboratory Welder

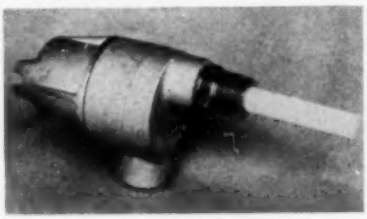
. . . which eliminates the need for carbon arc lamps or gas welding equipment. An inexperienced operator can make thermocouples by adding flux to the metal, touching the couple to the electrode, and pushing a button. All "Kup-L-Weld" components are encased in a single housing with an adjustable permanently mounted filter to protect the operator from flash. Operating from conventional 115 V., 60 cycle current, the welder can handle chromel-alumel, chromel-constantan, copper-constantan, iron-constantan, and platinum-rhodium thermocouple metals. Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.

Circle No. **9** *on Reply Card*

Heat Mantle Uses New Fabric To Withstand Rough Handling

. . . and is designed for temperatures up to 650° C. The fabric in the new Type R Mantle has break-resisting and wear-resisting properties which make it practical for use in high temperatures for large kettles or receptacles such as those used in pilot plants or small production plants. It is said to eliminate fabric breakage sometimes experienced with conventional quartz mantles designed for similar temperature ranges. The Nichrome resistance wire element is woven into the fabric, spirally from the bottom upwards. Spacing between wires is small at the bottom of the mantle, increasing toward the equator of the kettle or container for which the mantle is designed. Consequently, the area of greatest heat input is around the bottom center. Mantles for extremely large equipment have multiple heating circuits for more precise temperature control. Mantles are available for equipment with capacities from 1 to 200 gals. Glas-Col Apparatus Co., Inc., 711 Hullman St., Terre Haute, Ind.

Circle No. **10** *on Reply Card*



Water in Hydrocarbons Detected By Capacitance Type Probe

. . . which will give a positive alarm for as little as 3% water in crude oil. The "Prob-A-Larm" has a stable bridge circuit for accuracy and a controlled feedback oscillator for high gain. A test circuit allows testing of all components from a remote location. Available in weatherproof housings for surface or panel mounting and explosion-proof housings for surface mountings. Chassis adapted to rack mounting for multiple installations. Jarco Services, Inc. 725 S. Erie, Tulsa, Okla.

Circle No. **11** *on Reply Card*

New Industrial Liquid Cleaner Purges Fats, Oils, and Greases

. . . and blends readily with any of the petroleum hydrocarbons to form stable emulsions with water for use in cleaning operations. It is claimed not to harm painted surfaces, and contains no chlorinated solvents harmful to the skin. It has a relatively high flash point. "Petroclean D-25" imparts a rust preventive film to machined parts said to last for several days if the part is not rinsed by water. Its use is recommended for manual operations, soap tank, dip cleaning, or pressurized spray systems. It can be used where alkaline cleaners cannot be employed, or as an emulsion cleaner in conjunc tion with caustic soda for the reconditioning of drums. The Whistlclean Corp., 404 Fourth Ave., New York 16, N.Y.

Circle No. **12** *on Reply Card*

New Sensitive Leak Detector Is Simple Mass Spectometer

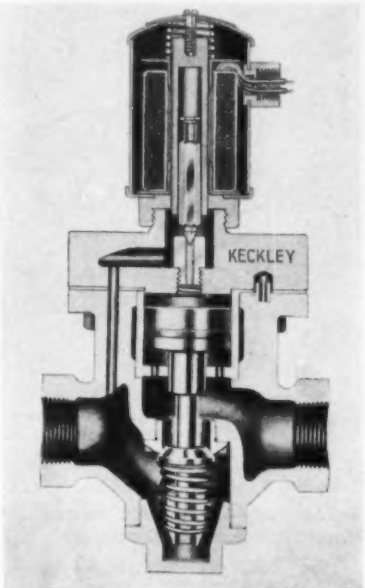
. . . able to detect minute traces of inert, non-contaminating helium. Helium, the testing agent, passes through the smallest leaks in parts, equipment, or systems under test and is detected. The detector can detect one part of helium in two-million parts of air. Especially useful in applications involving large vacuum systems where evacuation requires auxiliary pumping and a detectable dilution of the test helium, the detector is also applicable for leaks in electronic tubes and containers where trace-quantities are of importance. The Model "24-110 Leak Detector" requires 115 volt, 60 cycle power, and is mounted on casters. Consolidated Engineering Corp., 300 N. Sierra Madra Villa, Pasadena 8, Calif.

Circle No. **13** *on Reply Card*

Rugged New Thermocouple Features Fast Response

. . . requiring about ¼ microsecond for the junction temperature to reach 63.2% of the amplitude of a step-change. A one micron (0.00004 in.) junction plating allows the fast response. Designed to operate under adverse conditions, it has been tested up to 60,000 psi under conditions of mechanical vibration. There is a small model for use in thin walls, and a large one for thick walls. Engineering Division, Midwest Research Institute, 4049 Pennsylvania, Kansas City, Mo.

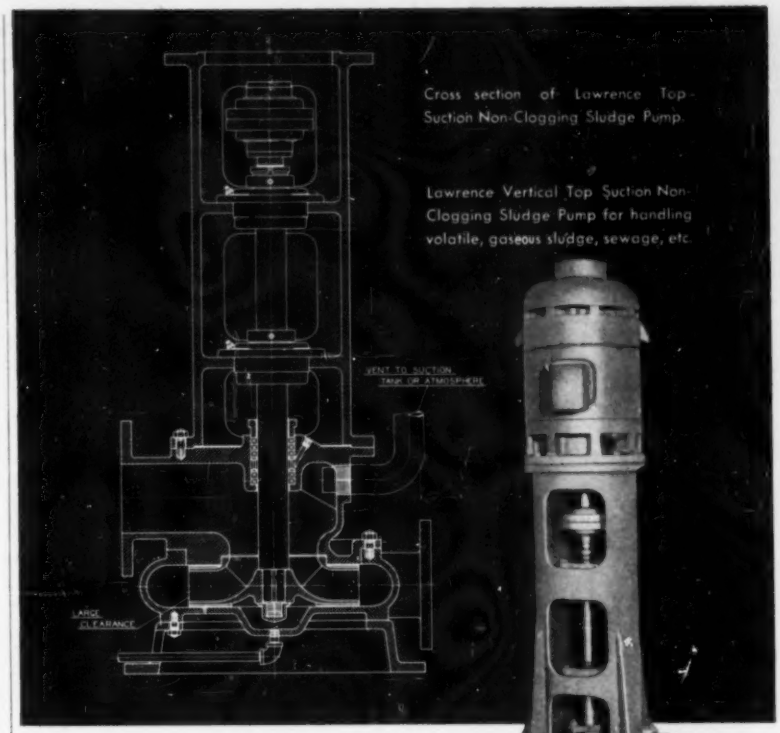
Circle No. **14** *on Reply Card*



Pilot-Operated Solenoid Valves Designed for 250 psi Steam

. . . or air, water, oil and gas service to 600 psi. In operation, the main valve opens, admitting pressure to the top of the main valve piston. When the pilot valve closes, pressure above the piston relieves, allowing the main valve to close. All wearing parts of the pilot valve and main valve are renewable. Valve bodies are of bronze or semi-steel, and the pilot valve, main valve and seat are of stainless steel. For air, gas and water service, teflon seat rings for both pilot and main valve are available for positive shut-off. Solenoid coils are glass insulated and moisture-proof for high temperature pressure service. Sizes for the type "EA" are ½ in. through 6 in. O. C. Keckley Co., 400 W. Madison St., Chicago 6, Ill.

Circle No. **15** *on Reply Card*


Cross section of Lawrence Top-Suction Non-Clogging Sludge Pump.
Lawrence Vertical Top Suction Non-Clogging Sludge Pump for handling volatile, gaseous sludge, sewage, etc.
VENT TO SUCTION TANK OR ATMOSPHERE
LARGE CLEARANCE

PUMP *volatile*

SLUDGES AND SLURRIES

...without clogging
...under a low net positive suction head (NPSH)
...without gas or vapor binding

The Lawrence Non-Clogging Top Suction Pump is designed specifically to handle volatile sludges and slurries. Large clearances through the impeller and casing completely prevent clogging. Volatile gases or vapors liberated at the impeller entrance (the point of lowest pressure), are pushed up and out of the way and can be vented back to the suction tank or exhausted to atmosphere.

This type of pump can operate with a very low Net Positive Suction Head (NPSH) and never become gas or vapor bound. It is made in all metals and alloys such as: — cast iron, bronze, stainless steel, Hasteloy, etc. — depending on the material pumped.

For further details on Lawrence Non-Clogging Slurry and Sludge Pumps write for Bulletin 206-4.

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You get full 180° visibility . . . so you can read the liquid level from any point from which you can see the gage . . . with the New Convex Scale now available on Jerguson Truscale Remote Reading Gages. Scale markings are directly on the convex face and the indicator goes clear around the convex surface. You can stand at one end of the control room and instantly check your whole line up of Truscale Gages.

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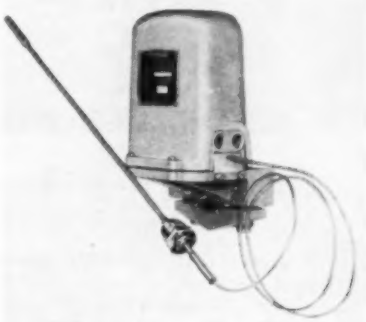
Controle Bailey, Paris, France

Mechanical Integrator Computes Metered Gas or Liquid Volume

. . . from orifice meter charts. The electrically operated "Integrator" has a counter setback assembly from the main calibration post enabling the operator to run charts at any base pressure. This and other features allows operation from chart to chart without the necessity of check runs. Points of motion and pivot points are set in ball bearings to eliminate wear. Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.

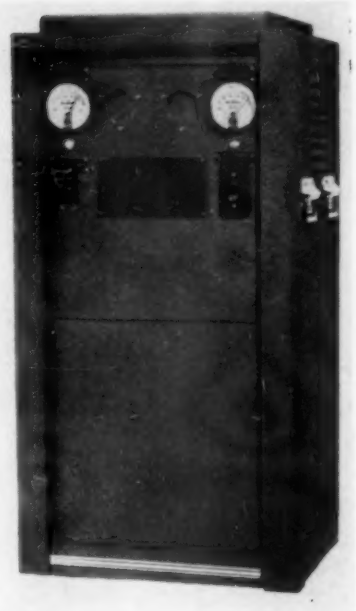
Circle No. **16** *on Reply Card*



Device Senses then Transmits Temperatures Pneumatically

. . . to a central recording or controlling station. The "Model 12A Temperature Transmitter" is a nonindicating device of the force balance type having a calibrated accuracy of ½% of the temperature span. Ambient temperature and barometric pressure variations are compensated. It is designed around a gas filled thermal system which exerts force on a flapper-nozzle mechanism in proportion to the measured temperature. The back pressure resulting in the nozzle circuit is amplified through a relay, then converted to a force through a bellows which balances out the initial force giving the 3 to 15 psi output from the instrument. Temperature spans of 50° to 400° F. are available over the range of —100° F. to 1000° F. The temperature bulb is connected to the transmitter by 3½ ft. of Geon-protected capillary tubing. The instrument can be mounted to any vertical or horizontal pipe or surface by means of a block and clamp. It is weather-proofed permitting installation in hazardous or corrosive areas. The Foxboro Co., Foxboro, Mass.

Circle No. **17** *on Reply Card*



Heavy Duty Ultrasonic Power Generator Speeds Cleaning

. . . of small parts difficult to clean conventionally. Suitable for cleaning and degreasing of metal, rubber, plastics, glass and ceramics with blind holes and small recesses, the "Sonogen" 2000-watt generator may be installed in conjunction with conventional vapor-degreasing systems. A barium titanate transducer receives 100,000 cycle/second radio frequency output from the generator, setting up mechanical vibrations in the cleaning solvent into which the transducer and part to be cleaned are immersed. Parts requiring 10 minutes to clean by rinsing are claimed to have been cleaned in 2 seconds by ultrasonic vibrations. Can also be used in laboratory for emulsification, dispersion, and the acceleration of chemical reactions. Weight approx. 350 lbs., 43 in. high by 23 in. wide by 18½ in. deep. Branson Ultrasonic Co., a division of Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn.

Circle No. **18** *on Reply Card*

New

Take a closer look at what's required to make High Pressure Tubing to handle

30,000 psi

Pressures of 30,000 psi are accepted industrial practice today. They are not only representative of the advances in alloy tubing technology and manufacture, but also of the tremendous strides taken by the industries in which these elevated pressures are everyday working practice.

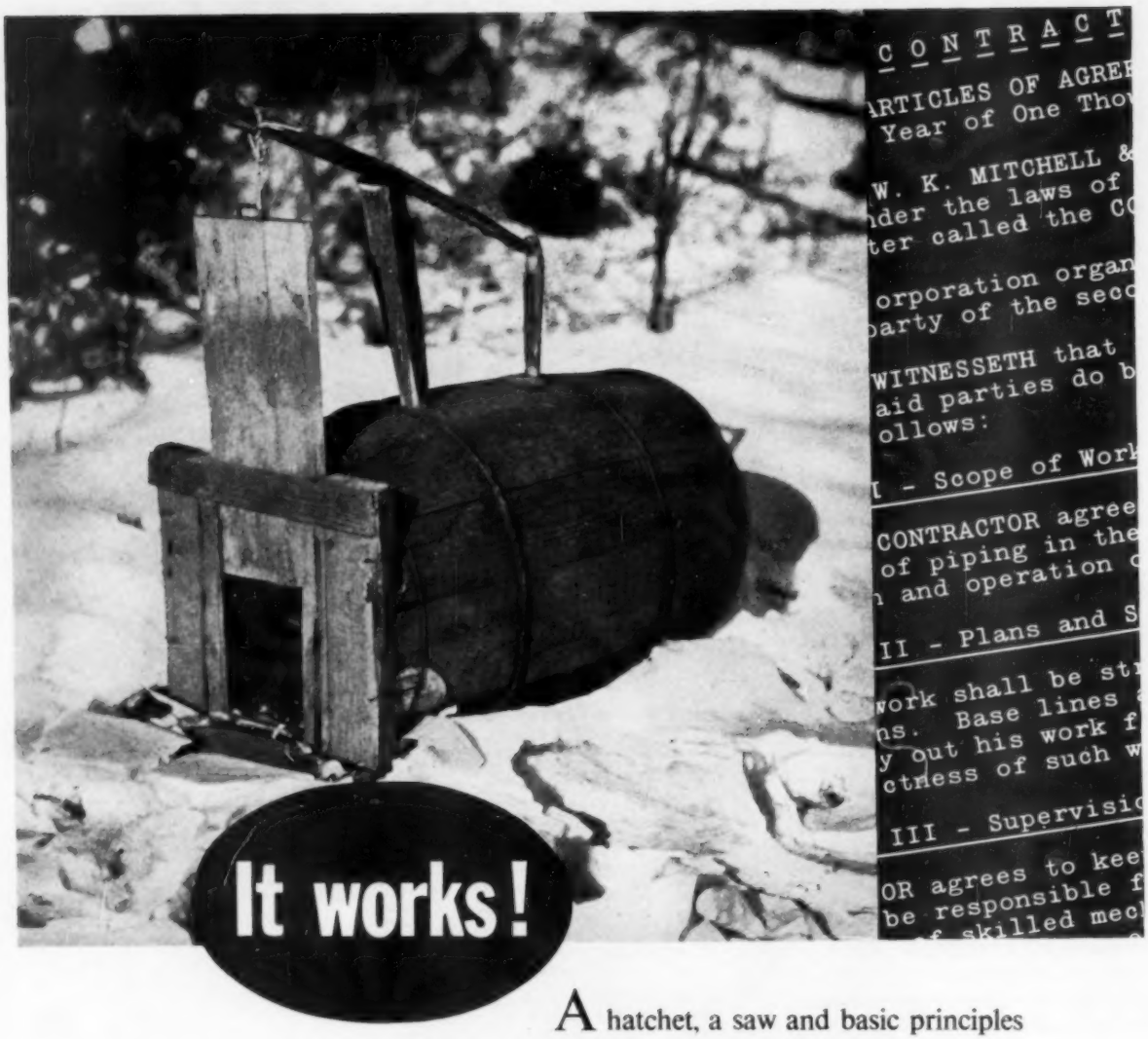
As pressures advance so must manufacturing techniques. For example, B&W was called upon recently to manufacture a special alloy tubing for polyethylene equipment based on Croloy 12 (AISI 410), to prevent product contamination. Special manufacturing and inspection techniques were involved in the production of the tubing which was cold finished to size. It was then heat-treated to obtain 100,000 psi yield strength, which could have been considerably higher except for the fact that toughness was desired to meet the dynamic service stresses encountered in operation. A sample of the tubing then was tested to 80,000 psi and, in order to force rupture at this pressure it was necessary to remove half of the wall thickness by machining. This destructive testing was made to insure satisfactory working conditions *at pressures of 30,000 psi.*

This example, while fulfilling the needs of a specific purpose, serves also to indicate the scope of techniques and facilities you'll find at B&W. Today, with laboratory testing of alloy tubing reaching 200,000 psi, the experience and knowledge of those called upon to make a test a *working reality* are of prime importance. You'll find both at B&W. Call on Mr. Tubes any time to help you meet your needs—standard as well as special.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-4065(SSP)



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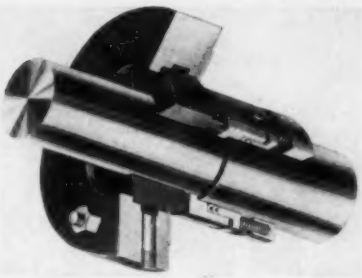
SINCE 1899

PIPING FABRICATORS AND CONTRACTORS

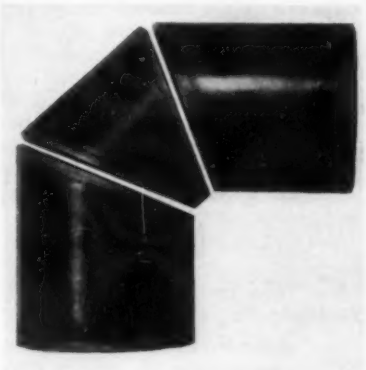
What's New!



Rotary Mechanical Seal Holds High Process Fluid Pressures

. . . from 50 to 600 psi at temperatures from —80° F. to 400° F. Called the "Type P.T. Inside Dura Seal-Balanced," it can be fabricated from selected alloys to handle all kinds of fluids except molten alkali metals and some fluorine compounds at higher temperatures. Mounting requires a cut-down shaft or stub sleeve and a packing space of ½ in. or larger. Durametallic Corp., 2104 Factory St., Kalamazoo, Mich.

Circle No. **19** *on Reply Card*



Low Pressure Weld Fittings Are Pre-Cut and Beveled

. . . to simplify field installation and turning problems. For use on low pressure transmission and distribution lines in the gas, water, and refining industries, they are pre-cut into sections, and trimmed with standard bevels for V-welding. Made from schedule 40 seamless steel tubing, the sections are ready for installation, requiring only to be lined up, tacked and welded. The section design gives flexibility to twist about 5° when joining pipelines which are out of position. They are made in all standard fittings, 22½°, 45° and 90° elbows, saddles for tees, and special shapes for sizes from 6 to 24 in. Gas Arc Supply, 223 N. 16th St. Philadelphia 2, Pa.

Circle No. **20** *on Reply Card*

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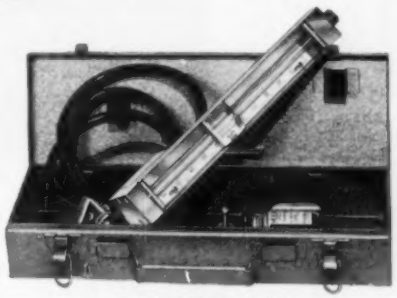
MANOMETER
ACCURACY

In custody transfer of valuable liquids or gases, greatest possible accuracy is required by both buyer and seller. Field measuring equipment must be precisely calibrated often. For this purpose Meriam Manometer Models B-2856 and B-2862 are extensively used.

The new, lightweight (twenty pounds) Meriam Model B-2856 Sectional U-Type Manometer in 100″ range using water offers the extreme accuracy and sensitivity required for calibration. All-aluminum construction, this model can be "broken" to 50″ length for carrying convenience. Interpolated readings to .025″water available.

The Meriam Model B-2862 Portable Field Manometer is the pioneer instrument for field calibration service. Designed with precision bore tubing, glass coated well, magnifier with anti-parallax device and a universal mounting bracket, this model in ranges up to 310″ water using mercury, offers a new high in utility and accuracy.

If you have a problem involving field calibration, drop us a line or call your Meriam Technical Representative. THE MERIAM INSTRUMENT COMPANY, 10989 Madison Avenue, Cleveland 2, Ohio.



Model B-2862 and Case

Model B-2856

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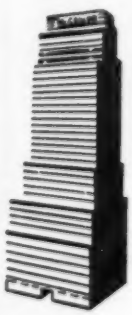

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Storage Cabinet Keeps Glass Tubing Clean, Dust-Free

. . . in removable compartments protected by a filter-seal door. Flexible construction allows storage of standard length tubing. The outside dimensions are 14 in. square by 52 in. long, and inside dimensions are 12¼ in. square by 50 in. long. Made of welded steel, it is finished in green baked enamel. Galvanized sheet compartments are made in three sizes to hold small or large tubing. The standard arrangement is four 6 in. square compartments, two 6 in. by 12 in. compartments, or one 12 in. square compartment. Units may be clamped together in tiers or banks to accommodate large quantities of tubing, or they may be hung from the ceiling or wall, or set on the floor or table. Bethlehem Apparatus Co., Ind., Hellertown, Pa.

Circle No. **21** *on Reply Card*

New Thickener for Non-Melting Multiple Purpose Greases

. . . that are oxidation stable and can be boiled in water for several days without breaking down. The thickener, "Estersil GT," is for making greases having high shear stability with both heat and water resistance, and showing relatively small consistency change under temperature variations. Thickened oils have properties combining the mechanical properties of the chemically inert thickener and the chemical properties of the oil. They are buttery and transparent with mechanical stability. They may be manufactured by a simple milling operation. Uninhibited estersil greases are claimed to have excellent oxidation stability since the estersil has almost no pro-oxidant effect. These greases are compatible with commercially available greases tested. Product Information Service, E. I. du Pont de Nemours & Co., Wilmington, Del.

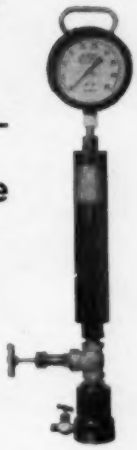
Circle No. **22** *on Reply Card*

REID VAPOR-PRESSURE BOMBS

For Either Pressure or Immersion Sampling

for testing Natural Gasoline – Benzol Blends – and other liquids not exceeding a vapor pressure of 45 lbs. at 100° F. by the Reid Method.

Construction conforms strictly to A.S.T.M. specifications. Requires no wrench—By means of the "O" ring gasket hand coupling will make a tight seal. Each bomb tested for 200 pounds air pressure.



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conform with ICC Regulations

Transport fixed or liquefied gases—even fluids corrosive to ordinary steels—in complete safety. Equally safe for pressure sampling under abnormally high temperatures.

Available for low or high pressure service, in single or double valve types. Sizes from 10 milliliters to 1 gallon. Standard sizes and types normally in stock—special cylinders available on order.

Wide selection of needle and packless valves for use with these cylinders.

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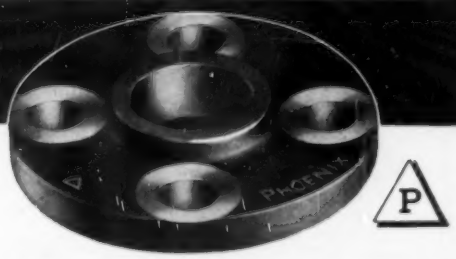
Fluid Control Specialists
161 S. DEAN STREET, ENGLEWOOD, N. J.

PHOENIX *Drop-Forged* FLANGES
MEAN . . .
MAXIMUM STRENGTH



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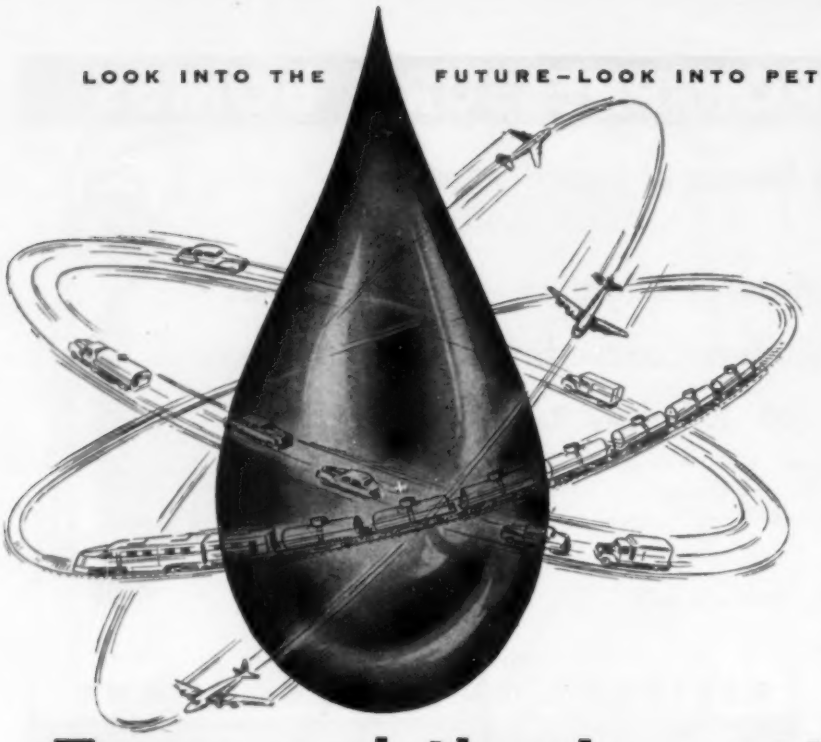
PHOENIX MANUFACTURING CO.
Catasauqua, Pa. • Joliet, Ill.

LOOK INTO THE FUTURE—LOOK INTO PETROLEUM PROCESSING



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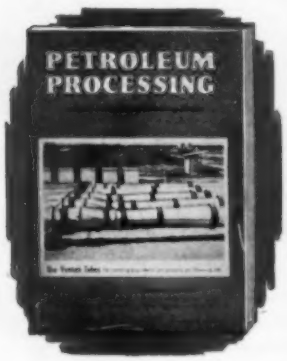


BECAUSE it has demonstrated its ability to save time for readers and still keep them well informed, *Petroleum Processing* has gained a top spot in the reading habits of petroleum and petrochemical processing men.

Technical knowledge, as well as processes and equipment, grows obsolete fast in petroleum processing. So the men who build and operate the high-speed, big volume processing units must have an efficient magazine like *Petroleum Processing:* terse and timely . . . yet thorough.

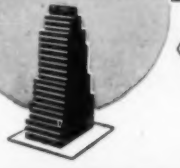
Petroleum Processing leads the field in this intensive coverage because it has the most experienced editorial staff. Its four top editors have all been with the publication since the first issue and have a combined experience of 71 years with the Platt petroleum publications. Their experience is indispensable in bringing to the reader all of the significant new developments in technology and operating practices—stripped of non-essential wordage. Their experience is essential in converting McGraw-Hill's world-wide business publishing facilities into useful tools for petroleum processing men. It is also essential in training the younger men now being added to the staff.

The thoroughness of technical coverage may be apparent only to our technical readers, but you don't have to be a technologist to recognize the superior format, better layout, more easily read headlines and captions. When you compare editorial quality, don't look for numbers of wordy pages filled with complicated formulas that belong in a textbook. Look for aids to efficient reading and real comprehension of the information vital to the reader, for stories edited to save reading time.

Petroleum Processing is *designed* and *produced* for fast, efficient communications within a fast, efficient industry.

PETROLEUM PROCESSING

NOW McGRAW-HILL PUBLICATION



ABP ABC

330 WEST 42ND STREET, NEW YORK 36, N. Y.

Pressure Sensitive Tape Is Chemical and Heat Resistant

. . . due to teflon body and silicone adhesive. The tape is a semi-transparent blue-gray color. Recommended for application to exposed surfaces to prevent corrosion, it is unaffected by temperatures of —65° F. to 350° F. The tape is 6-mils thick and has a tensile strength of 15 psi of tape width and an elongation of 300%. Laboratory tests showed no significant effect after application to glass panels and immersed for seven days in distilled water, 3% sulfuric acid, 30% sulfuric acid, 10% sodium chloride, and 1% sodium hydroxide. After being applied to steel plates and immersed for 10 days in 10% hydrochloric acid, there was no evidence of steel corrosion on the tape covered portion. Tape "No. 549" is made in ½ to 5 in. widths on 36-yd. rolls. Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

Circle No. **23** *on Reply Card*

Free Trade Literature

Catalytic Cracking

. . . applications for fuel oil reduction; *Houdry Pioneer, Vol. 7, No. 1* gives four refinery situations and their solution by "Houdriflow" catalytic cracking with material balances, yield data, and economic comparisons. Houdry Process Corp., 1528 Walnut St., Philadelphia 2, Pa.

Circle No. **24** *on Reply Card*

Temperature Controller

. . . for use up to 1800° F. operates by the differential expansion of solids and uses no filled bulb; *Bulletin 104* describes construction and gives operating specifications. Burling Instrument Co., 16 River Road, Chatham, N. J.

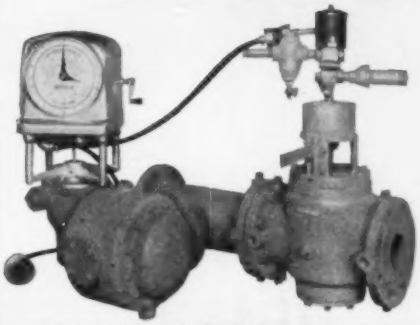
Circle No. **25** *on Reply Card*

Whether your liquid measuring problem involves

GALLONS —or BARRELS —or TANK CARS

THE *Fluidometer* SYSTEM

WILL GIVE YOU ACCURATE—AND COMPLETELY AUTOMATIC—BATCHING



If you have a liquid batching problem involving either light or heavy liquids, it will pay you to investigate the Fluidometer System. This completely automatic system, with its exclusive automatic reset, gives accurate, dependable batching and is adaptable to practically any liquid measuring problem, whether it involves gallons, barrels, or tank car lots. Available in either jacketed or unjacketed construction. Write for Bulletin Fl-49.

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REED TRADEMARK *Announces . . .*
. . a revolutionary
New HINGED PIPE CUTTER

You can cut off 8" pipe, *in less than 5 minutes*

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MAIL THIS COUPON TODAY

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Without obligation, please send me descriptive literature on your new hinged pipe cutters.

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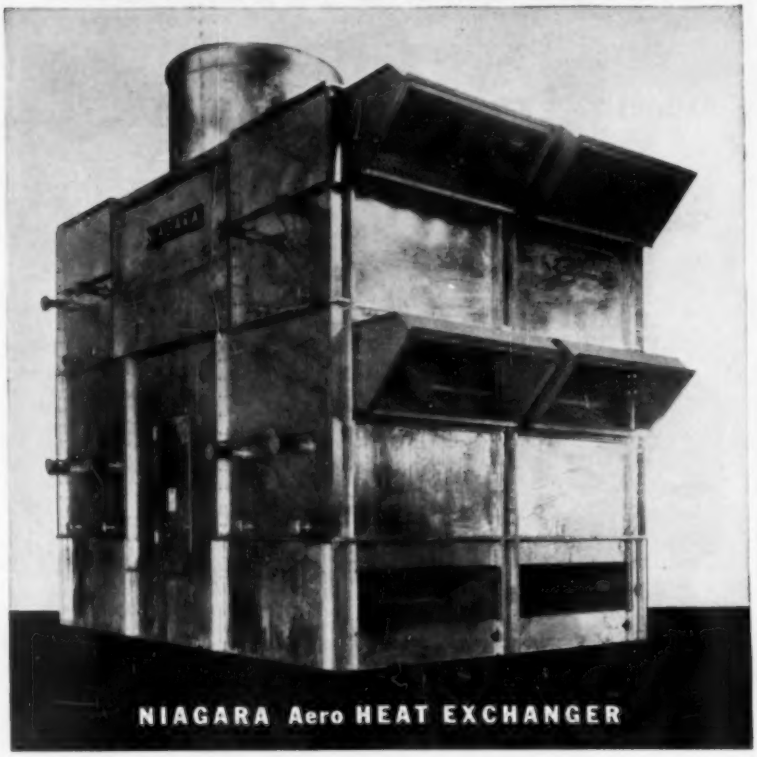
Thirty Million B.T.U. CAPACITY



NIAGARA Aero HEAT EXCHANGER

Cooling in Chemical Processes with Precise Control of Temperature

The NIAGARA Aero HEAT EXCHANGER cools liquids and gases by evaporative cooling with atmospheric air, removing the heat at the rate of input, controlling temperature precisely. You save 95% of cost of cooling water; you make great savings in pumping, piping, power; quickly recover your installation cost.

You can cool and hold accurately the temperature of all fluids, air and gases, water, oils, solutions, chemical intermediates, coolants for mechanical, electrical and thermal processes. You obtain closed system cooling free from dirt. You solve all the problems of water availability, quality or temperature.

In CHEMICAL PROCESSES this is successfully used in cooling liquids and gases, chemical reactions, condensing distillations and reflux cooling.

Write for complete information; ask for Bulletins 120 and 124. Address Dept. PP.

NIAGARA BLOWER COMPANY

405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities of United States and Canada

What's New!

Digital Process Data Recording

. . . for petroleum, chemical, and pipe line industries can measure 2000 process points with eight different variable ranges and record on printed sheets, punched tapes, printed tapes, or punched cards; *The Metrotype System of Digital Recording and Telemetering* describes the operation of the system. Metrotype Corp., 6100 Archer Road, Summit, Ill.

Circle No. **26** *on Reply Card*

Liquid Depth Tank Gage

. . . operates on the principle of static pressure and may be located up to ¼ mile from tank, either above or below the tank elevation; *Bulletins 2000A and 2004* give installation method, description, and selection chart for "Petrometer" tank gages used with different liquids. Liquidepth Indicators, Inc., 43-22 Tenth St., Long Island City 1, N. Y.

Circle No. **27** *on Reply Card*

Light Measuring Unit

. . . is a computing flicker photometer operated as a comparison recorder and can be adapted as a "building block" in color, transmission, reflectance and intensity measuring equipment; *I.D.S. 10.10-5* describes principle of "Colorede," application to process instrumentation and operation. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa.

Circle No. **28** *on Reply Card*

Steel Drum and Pail Standards

. . . for steel shipping container buyers; *Recommended Universal Standards for Steel Drums and Pails*, published Oct. 1, 1954, has specifications and dimensions for 55 and 30-gal. tight head drums, 16-gal. removable head grease drum, and 5-gal. tight head and lug cover pails. Steel Shipping Container Institute, Inc., 600 Fifth Ave., New York 20, N. Y.

Circle No. **29** *on Reply Card*

Burner Combustion Control

. . . optically monitors oil and gas main pilot flames and shuts off all fuel two to four seconds after flame failure; *Installation Bulletin CF-30* describes operation, installation and servicing. Combustion Control Div., Electronics Corp. of America, 718 Beacon St., Boston, Mass.

Circle No. **30** *on Reply Card*

COMPRESSED AIR separator drainage with No. 21 Armstrong trap for use with small compressors.
DRAINING WATER from separator in compressed air or gas line with No. 71 "snap-action" trap.
OVERFLOW LEVEL CONTROL hookup with No. 242 forged steel compound lever trap.

HOW TO *Select* BALL FLOAT TRAPS

for: 1. Draining *water* from air, gas or steam lines.

2. Draining *light liquid* from gas under pressure.

NEW ARMSTRONG BULLETIN 289 GIVES COMPLETE DATA

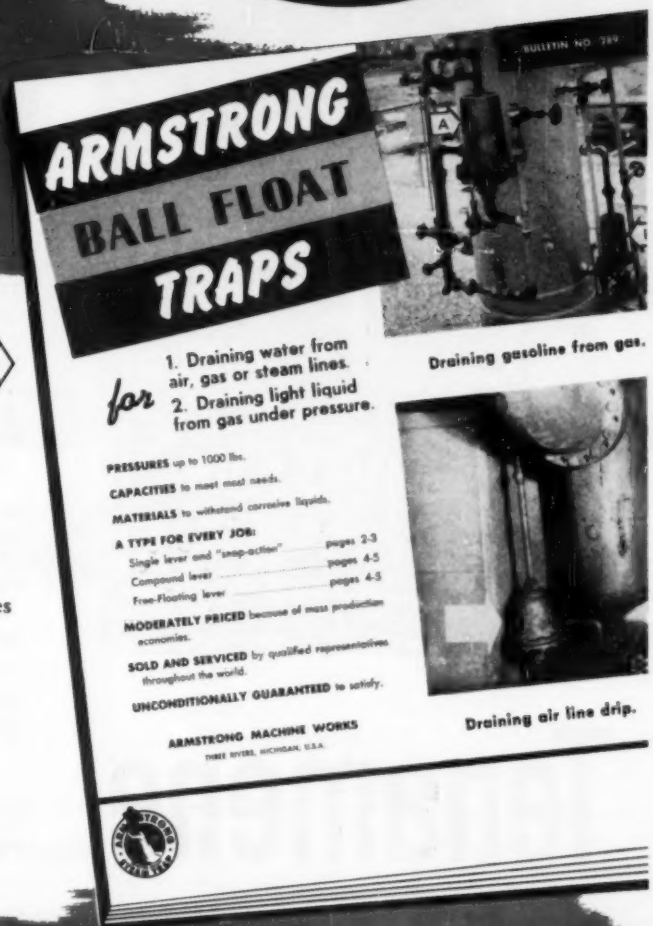
For automatic drainage of water or light liquids from gases, Armstrong ball float traps offer dependability, economy and low maintenance.

For selection of the right trap for the job, new Bulletin 289 is your guide. Selection data include a capacity chart for different orifice sizes, conversion table for light liquid capacities and tables of operating pressures by trap and orifice sizes.

Physical data, prices, hookup drawings and ordering instructions complete the picture.

Call your local Armstrong Representative or write for Bulletin No. 289.

ARMSTRONG MACHINE WORKS
826 Maple Street • Three Rivers, Michigan
Makers of Armstrong Inverted Bucket Steam Traps


ARMSTRONG
BALL FLOAT
TRAPS
for 1. Draining water from air, gas or steam lines.
2. Draining light liquid from gas under pressure.
PRESSURES up to 1000 lbs.
CAPACITIES to meet most needs.
MATERIALS to withstand corrosive liquids.
A TYPE FOR EVERY JOB:
Single lever and "snap-action" pages 2-3
Compound lever pages 4-5
Free-Floating lever pages 4-5
MODERATELY PRICED because of mass production economies.
SOLD AND SERVICED by qualified representatives throughout the world.
UNCONDITIONALLY GUARANTEED to satisfy.
ARMSTRONG MACHINE WORKS
THREE RIVERS, MICHIGAN, U.S.A.
BULLETIN NO. 289
Draining gasoline from gas.
Draining air line drip.

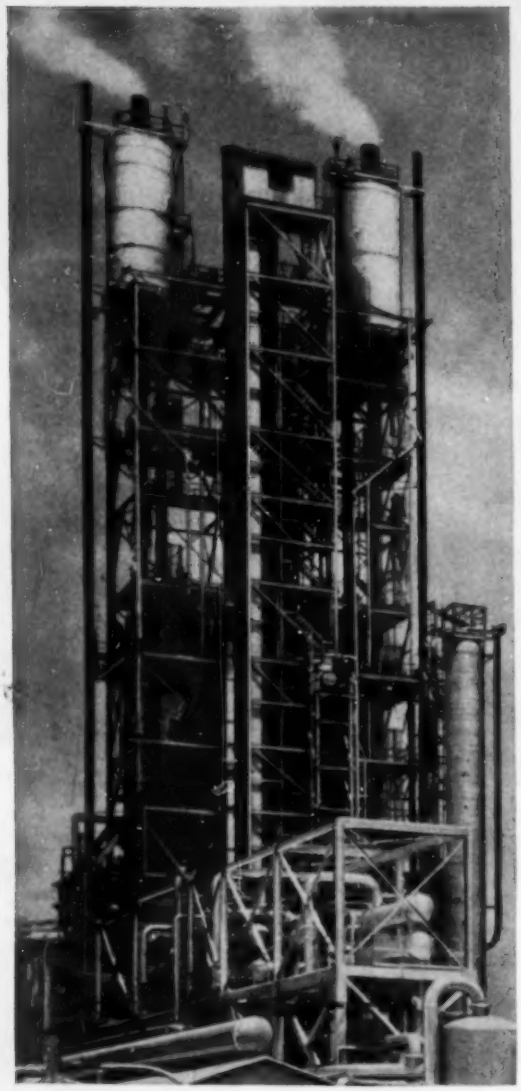
ARMSTRONG *Ball Float* TRAPS

when you install catalytic cracking equipment—

investigate the economy

of **TENAMENE**

inhibitor-sweetening



Nearly all catalytically cracked gasolines respond to Tenamene inhibitor-sweetening—The economy inherent in this single sweetening-gum inhibiting process should be considered by all refiners now constructing or contemplating the construction of cat-cracking units. Important factors which may influence your plans are:

Double function —Tenamene 2 acts both as antioxidant to inhibit gum formation, and as a sweetening agent.

Low cost —only 5 lbs. of Tenamene 2 per 1000 barrels of gasoline usually are needed . . . about ½¢ per barrel.

Low installation cost —the process to sweeten with Tenamene is so simple, very little basic equipment is needed.

Savings on maintenance and operation —these costs are negligible compared to most other processes.

No octane loss —no danger of the presence of free sulphur —as in some processes.

No gasoline loss —no addition of chemicals at elevated temperatures.

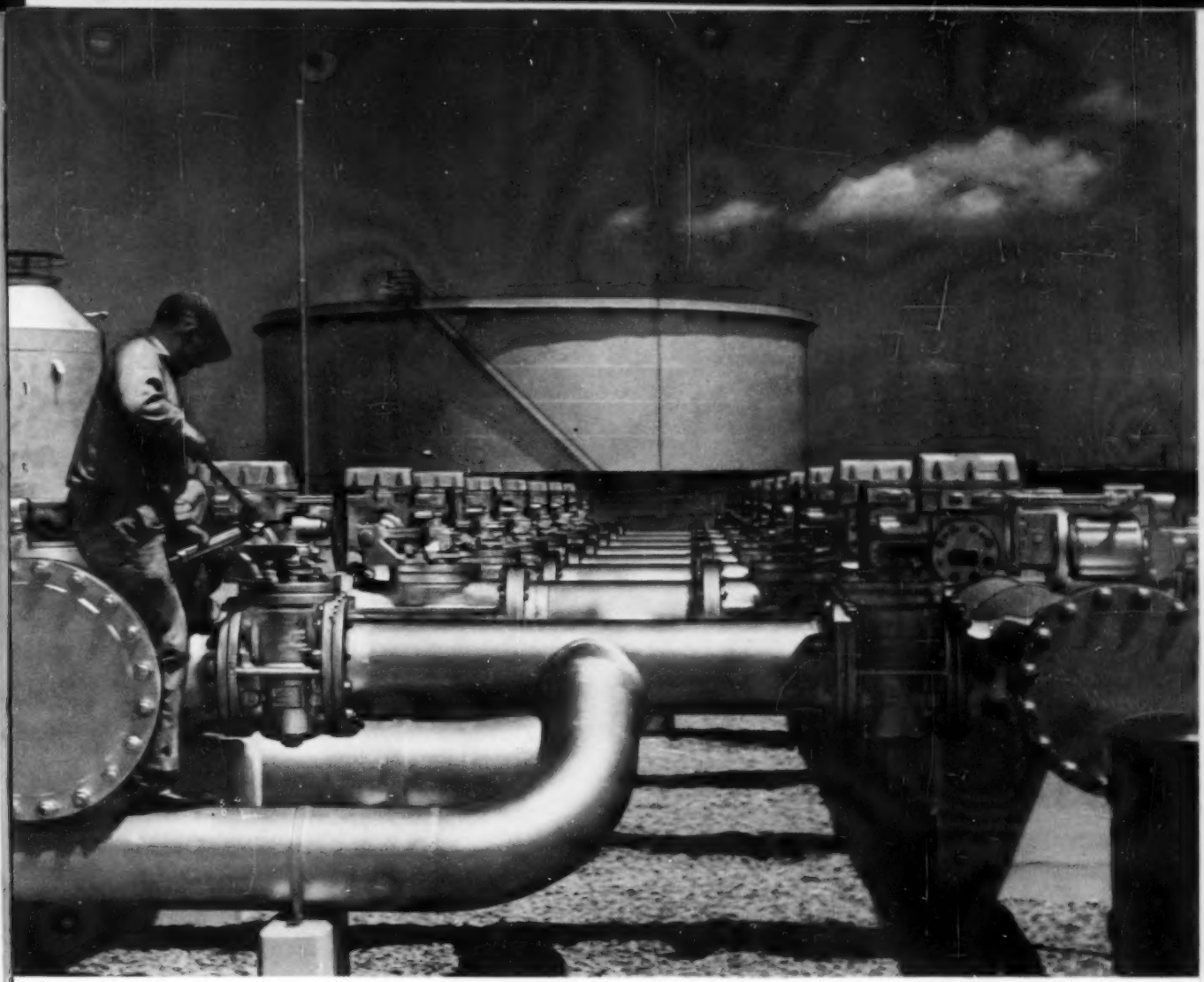
No deleterious chemicals added —such as sulphur or copper.

PROMPT SERVICE: Eastman's highly qualified technical staff and modern gasoline laboratories are at your service. We welcome the opportunity to discuss Tenamene inhibitor-sweetening with you at your convenience. Contact your local representative or write to Eastman Chemical Products, Inc., Kingsport, Tennessee—a subsidiary of Eastman Kodak Company.

Tenamene

EASTMAN GASOLINE ADDITIVES

SALES OFFICES: **Eastman Chemical Products, Inc.,** Kingsport, Tenn.; New York—260 Madison Ave.; Framingham, Mass.—65 Concord St.; Cincinnati—Carew Tower; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **West Coast: Wilson Meyer Co.;** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave.; Seattle—821 Second Ave.



PICTURE OF MAINTENANCE COSTS BEING LOWERED

Every plant that keeps complete records comes to the same conclusion—periodic valve lubrication *saves* money; it's valve failure and replacement that sends maintenance costs skyward.

That is the basic fact behind the Rockwell-Nordstrom valve design, for the internal lubrication system eliminates most reasons for valve failure—Rockwell-Nordstrom lubricant *prevents* galling, jamming, abrasive wear, and seepage.

Systematic lubrication of Rockwell-Nordstrom valves with the right Rockwell-Nordstrom lubricants inevitably leads to lower operating costs. There is no substitute for Rockwell experience—use it to save money on valves. *Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.*

THREE WAYS
THE NORDSTROM LUBRICANT WORKS

1. Lubricant surrounds each valve port with a vapor tight pressurized seal. **Nordstrom valves stay tight.**
2. Lubricant acts as hydraulic jack—a fast quarter-turn to open or close. **Nordstrom valves operate quickly.**
3. Lubricant coats the plug for sliding action—no wear-producing wedging. **Nordstrom valves operate easily.**

Rockwell Built

NORDSTROM VALVES

Lubricant-Sealed for Positive Shut-Off

WHICH PRODUCT IS EASIEST TO MAKE?

Every manufacturing process has its own special problems. There's no fair way to compare the difficulties of processing paint and paper, or of synthetic rubber and synthetic textiles, for instance.

In every process industry, too, there are special problems of flow control, and no matter what claims you read, there is no such thing as an all-purpose valve.

Undoubtedly, Rockwell-Nordstrom valves approach that point more closely than others because they use the Nordstrom-originated principle of internal lubrication. Rockwell-Nordstrom lubricants seal tightly in gas, liquid or slurry service, and at the same time make operation easy, and eliminate galling or seizing.

Further, Rockwell-Nordstrom makes the widest range of sizes, pressure classes, metals and lubricants, so that for any process, you're wise to check first with *Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.*

Nordstrom Valves

Another Quality ROCKWELL Product

Simplified Packing Selector

. . . for gaskets, valve stems and centrifugal and reciprocating pumps; selects most economical packing for water, steam, brine, ammonia, etc., by rotating indicator disk beneath selector window. Request on company letterhead to New York Belting & Packing Co., 1 Market St., Passaic, N. J.

Do Not Use Reply Card

Petroleum Pipe Line Problems

. . . and the requirements for maintaining control of variables; *Bulletin No. PL-1* is the first of a series describing the pipe line system, variables to be measured, and some pipe line control problems. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa.

Circle No. **31** *on Reply Card*

Process Monitoring and Control

. . . for petroleum and chemical industries; *Bulletins CEC-1301, 1302A, and 1304* describe the use of mass spectrometers, digital recorders, analogue data-recording systems and analogue-to-digital converters. Consolidated Engineering Corp., Pasadena 15, Calif.

Circle No. **32** *on Reply Card*

Pipe Line Surge Control

. . . operates with a nitrogen filled, welded, stainless steel bellows; *Magnilastic Newsletter Vol. 2, No. 20* gives specifications, tables and formulae for "Pressurized Hydropads." Cook Electric Co., Magnilastic Div., 2700 N. Southport Ave., Chicago 14, Ill.

Circle No. **33** *on Reply Card*

Lubricated Plug Valves

. . . for service with gasoline, oil, water, air, gas, acids, caustics, and other chemicals; *Catalog No. 5-1954* gives dimensions and specifications for ½ in. to 12 in. sizes of various metals with or without steam jacketing. ACF Industries, Inc., 30 Church St., New York 8, N. Y.

Circle No. **34** *on Reply Card*

Refractory Grain Materials

. . . for furnace and reactor lining, including fused alumina, silicon carbide, fused magnesia, fused zirconia and boron carbide; *Form 1741* gives melting points, electrical and physical properties, available grain sizes and applications. Norton Co., Worcester 6, Mass.

Circle No. **35** *on Reply Card*

Low-Temperature Insulation

. . . for pipes is made of foam styrene, will not rot, freeze, swell or waterlog; *Vapo-Wall* bulletin, price charts, specification sheets and other data give details on performance, uses and costs. MMM Inc., 7120 Ave. C., Houston, Texas.

Circle No. **36** *on Reply Card*

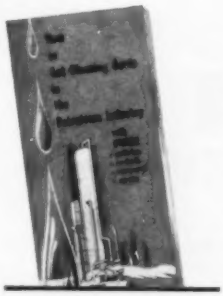
Vinyl Chloride Plasticizer

. . . extender dry blends easily and reduces viscosity build-up of extended material; *Technical Bulletin No. O-P-153* gives properties, performance and viscosity data. Monsanto Chemical Co., St. Louis 4, Mo.

Circle No. **37** *on Reply Card*

STORAGE TANKS

paint-stripped in less time—at less cost



SEND for this FREE Booklet. It is full of useful information on general maintenance cleaning. Covers all divisions of the Petroleum Industry—production, processing, transportation, marketing.

BUT FAST—that's how old paint rolls off when you strip tanks the money-saving Oakite way.

Powerful Oakite strippers, applied by hot-flow-on, steam gun, or cold-flow-on method, actually float off paint, dirt and grease. You save time . . . no hand-scraping or chipping. You save money . . . long-life solution may be reclaimed and reused. No expensive sand blasting. And you're safe . . . no fire hazard.

Ask your local Oakite Technical Service Representative for on-the-spot demonstration. Or write for Booklet F7629. No obligation. Oakite Products, Inc., 44C Rector St., New York 6, N.Y.

. . . *Technical Service Representatives in Principal Cities of U. S. & Canada* . . . . .

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

PETROLEUM SERVICE DIVISION

Cooling Tower Tests

. . . require a minimum of apparatus and effort to determine performance; *Technical Bulletin R-54-P-5* tells how to "Test Your Tower," giving procedure and use of performance rating charts. Technical Services Dept., The Marley Co., 222 W. Gregory Blvd., Kansas City, Mo.

Circle No. **38** *on Reply Card*

Butyl Carbitol Acetate

. . . solvent for use in nitrocellulose and resin coatings, printing inks, and the extractive separation of alcohols and ketones; *Technical Bulletin F-8644* gives physical properties, specifications, shipping data, and applications. Carbide and Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y.

Circle No. **39** *on Reply Card*

Self-Balancing Pyrometers

. . . covering a range of —320° F. to +200° F. up to a range of 0° F. to 3000° F. in 23 available scales with an accuracy of ±¼ of 1% scale range; *Bulletin 61* gives descriptions and specifications for potentiometer pyrometer and resistance thermometer styles. Thermo Electric Co., Inc., Saddle River Township, Rochelle Park Post Office, N. J.

Circle No. **40** *on Reply Card*

Gas Analysis Kit

. . . for on-the-job determination of carbon dioxide or oxygen in flue gases, furnace atmospheres and other gas mixtures; *Bulletin No. 306* describes "Kwik-Chek" analyzer and gives listing of models and prices. Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.

Circle No. **41** *on Reply Card*

Pressure Vessel Fittings

. . . including welding necks, manways, nozzles, studding outlets, saddles, rings, flanges; *Catalog No. 10-53* gives complete specifications, technical data and prices. Lenape Hydraulic Pressing & Forging Co., P. O. Box 536, West Chester, Pa.

Circle No. **42** *on Reply Card*

High Velocity Oil Burners

. . . for use in furnaces, ovens, dryers and kilns utilize combustion heat to vaporize the oil before burning; *Bulletin 107* gives dimensional data, operating principles, applications and output data for "Thermal" burners. Thermal Research & Engineering Corp., Conshohocken, Pa.

Circle No. **43** *on Reply Card*

Suspended Solids Recovery

. . . from liquids by air flotation; *Technical Publication CS2* gives uses, efficiencies, typical flow diagrams and operating principles. Bulkley, Dunton Processes, Inc., 295 Madison Ave., New York 17, N. Y.

Circle No. **44** *on Reply Card*

Polyethylene Laboratory Ware

. . . for resistance to acids, alkalis and many salts, solvents and organic chemicals; *Catalog A954* lists equipment styles, sizes and prices. Palo Laboratory Supplies, Inc., 81 Reade St., New York 7, N. Y.

Circle No. **45** *on Reply Card*

TO POSITION DAMPERS, SLIDE VALVES and other control means →

ASKANIA

PNEU-DRAULIC VALVE POSITIONER

The Askania Pneu-Draulic Valve Positioner combines the advantages of both pneumatic and hydraulic control systems. It provides an air signal proportional to valve position, yet has incompressible fluid working at the heart of the unit.

Almost unlimited power can be smoothly and instantly applied with these positioners. For every increment of input signal between 3 and 15 p.s.i., the cylinder position finds a specific position within 1% of full cylinder stroke.

These positioners are rugged enough to withstand almost any abuse, because the signal amplifier has only one moving part—the well protected jet pipe.

Write for bulletin No. 1—86

ASKANIA REGULATOR COMPANY
244 E. Ontario Street, Chicago 11, Illinois
Subsidiary of General Precision Equipment Corp.

Higher Strength at Lower Cost for Alloy Piping Systems

Imperial Oil's Edmonton Refinery served by KEY-KAST welding flanges

These Advantages of KEY-KAST *Fittings Can Mean Improved Piping Performance for You.*

- Greater wall thickness throughout—for increased structural strength
- Extra thickness in critical areas — for greater allowance against erosion
- Lower unit cost
- Meet A.S.M.E. and A.S.A. Codes
- Rigid testing and inspection to meet high standards of quality

An important part of Imperial Oil Company's refinery at Edmonton, Alberta, Canada, is this fluid catalytic cracking unit, with a capacity of 7,600 barrels a day. It supplies feed-stock for the growing petrochemical industry and for Imperial's Calgary alkylation plant, where high-octane aviation gasoline is produced.

This modern cat cracker is a unit of one of several Imperial refineries served by KEY-KAST Alloy Steel Welding Fittings and/or Flanges. KEY-KAST Fittings and Flanges are available in every shape, size and schedule, in low and intermediate alloys and various stainless steels.

WRITE FOR BULLETIN K-1

key company

Since 1916 . . . manufacturers and developers of products for high temperatures and pressures

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OPENING NEW HORIZONS IN ACCURACY!

Now tank farms and refineries can maintain at least 100% greater accuracy with the new Gilbarco Electronic Tank Gauge. *No other tank gauge today* offers all these advantages for liquid measurement:

★ **Accurate** to 1/16 of an inch.

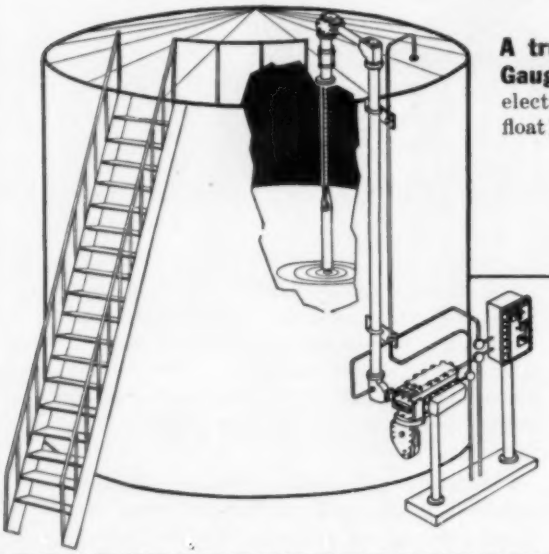
★ **Exterior Installation** and maintenance, without taking tank out of service.

★ **Not affected** by variations in specific gravity or viscosity.

★ **Can be used** in any type of low pressure tank.

★ **Can be supplied** with automatic switches and an instrument to indicate the average temperature of the product.

★ **Remote reading** equipment available for accurately transmitting temperature and liquid level data.



A truly Electronic Tank Gauge—actually *measures* electronically, not with a float!

For assured accuracy... get all the facts on the new Gilbarco Electronic Tank Gauge today!

GILBERT & BARKER MANUFACTURING CO.
West Springfield, Mass.

Please send us complete information on the Gilbarco Electronic Tank Gauge.

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COMPANY_____

ADDRESS_____

CITY_____ STATE_____

Gilbarco

West Springfield, Mass.
Toronto, Canada

Pneumatic Level Control

. . . utilizes inert capacitive-type sensing probe and electronically operated pneumatic pilot valve; *Form CP2-854* lists applications, operation, installation and specifications. Thermo Instruments Co., 1310 County Road, Belmont, Calif.

Circle No. **46** *on Reply Card*

Liquid Level Indicator

. . . with a claimed accuracy of 1/16 in. suited for commercial vacuum and pressure ranges is not affected by ambient temperature changes or liquid properties; *Bulletin LLM 9545* describes the "Techniflex Liquid Level Monitor" with applications and prices. Techniflex Corp., Port Jervis, New York.

Circle No. **47** *on Reply Card*

Petroleum Accident Rates

. . . for 1953 and a summary of accident rates in other industries; 1954 *Accident Rates* provides current accident rates, historical rundown of rates for some years back, and a rating of each industry with respect to 40 industrial classifications. National Safety Council, 425 North Michigan Ave., Chicago 11, Ill.

Circle No. **48** *on Reply Card*

Recording Spectrophotometer

. . . records absorption spectra from 2000 angstroms to 2.6 microns on a linear wavelength scale with a double monochromator and flicker beam photometric system; *Bulletin No. P51* describes principles and operation, giving specifications for all models. Applied Physics Corp., Pasadena, Calif.

Circle No. **49** *on Reply Card*

Atomic Batteries

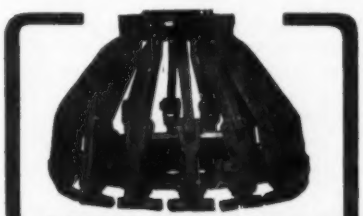
. . . and the measurement of specific gravity and liquid level; *Bulletin 105* describes principles of "Ohmart Cells," operational ranges and auxiliary equipment. The Ohmart Corp., 2236 Bogen St., Cincinnati 14, Ohio.

Circle No. **50** *on Reply Card*

Pressure Transducer

. . . for fluctuating pressures is compact and operates on strain-gage principle; *Form PT654* describes installation and gives specifications. Electronic Engineering Associates, Ltd., 1066 Brittan Ave., San Carlos, Calif.

Circle No. **51** *on Reply Card*



BARRETT automatic

Filling and Crimping Equipment

for handling greases and other viscous fluids.

- No operator required.
- 100% air operated.

Fills, seals, stamps and counts lug cover pails. Output of 15 pails per minute. Write for details on installation to meet your requirements.

BARRETT
Manufacturing Co.
P. O. Box 8096, Houston 4, Texas

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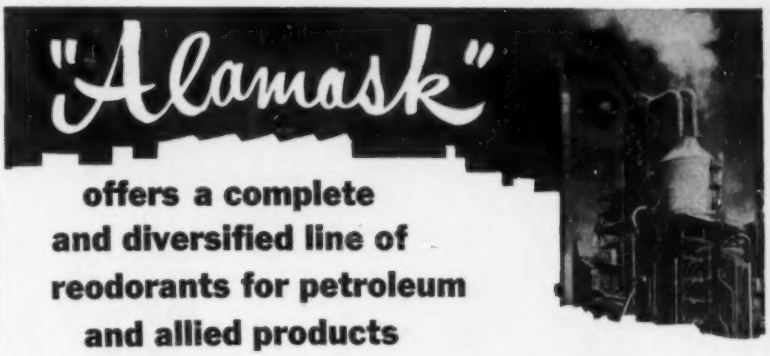

offers a complete and diversified line of reodorants for petroleum and allied products

No longer need the products of the petroleum industry inflict upon their users the obnoxious odors resulting from the mercaptans and sulfides in their processing.

Years of development work and product-testing have culminated in a complete line of Alamask® reodorants that can successfully mask the objectionable odors of many petroleum products. Check this table to see which Alamask reodorants will solve your malodor problems:

"ALAMASK"	GASOLINE FRACTIONS	ASPHALTIC COMPOUNDS	KEROSENE BLENDS	COAL SPRAY OILS	SPACE HEATERS	CUTTING OILS	CLUTCH OILS	DIESEL FUELS	JET FLUIDS	MINERAL SPIRITS	WAXES	NAPHTHA	BURNER OILS
AAM								X					
AO						X	X						
AR		X								X			
BGM		X											
BN						X	X						X
BUL				X	X			X			X		X
CC			X							X			
CE			X							X			
CX											X		
MS			X							X	X	X	X
0.19	X				X	X	X		X				X
0.20	X				X	X	X		X				X
TO									X				

Rhodia's chemists and engineers, experienced in odor abatement and waste disposal, will provide technical assistance to you in your efforts to correct malodors.

For complete information on these new, highly-effective reodorants, write today to Rhodia, Inc., Industrial Reodorants ("Alamask") Division, 230 Park Avenue, New York 17, N. Y.

Rhodia INC.

Instrument Tubing Troughs

. . . for permanent and continuous support using prefabricated steel parts; *Bulletin 254* gives details, dimensional drawing, and actual installation examples. Instrof, Inc., 4923 Pentridge St., Philadelphia, Pa.

Circle No. **52** *on Reply Card*

Laboratory Equipment

. . . including high-pressure needle valves, stainless steel ware, ultra-violet equipment, transparent dry blending equipment, mixers, etc.; *Bulletin 541* lists models and prices. A. Daigger & Co., Kinzie at Wells, Chicago 10, Ill.

Circle No. **53** *on Reply Card*

Scaled Atom Models

. . . can be assembled in different color combinations to illustrate organic molecule structure; *Lanco Apparatus News, Vol. 6, No. 2,* describes the atom model, sub-sieve range particle size analysis, test sieve vibrator, analytical balance, infrared water bath, lattice rod support clamps, etc. Arthur S. LaPine & Co., 6001 South Knox Ave., Chicago 29, Ill.

Circle No. **54** *on Reply Card*

Miniature Recorder-Controllers

. . . for temperature, pressure, flow and liquid level are easily installed and compact; *Bulletin 7201* describes instruments and operation, giving specifications. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa.

Circle No. **55** *on Reply Card*

Electronic Air Cleaners

. . . feature rust-proof aluminum construction and operate by ionizing dust particles and depositing them on aluminum plates to be flushed by water; *Bulletin CB-20* describes the "Electro-Air" and gives dimensions, specifications and engineering data. Electro-Air Cleaner Co., 1285 Reedsdale St., Pittsburgh 33, Pa.

Circle No. **56** *on Reply Card*

Process Instrumentation

. . . for measuring and controlling flow, pressure, temperature, liquid level, gravity, and viscosity with electric, pneumatic and electronic transmitting; *General Catalog 1* lists complete line of above and other equipment. Fischer & Porter Co., Hatboro, Pa.

Circle No. **57** *on Reply Card*

Rubber-Lined Centrifugals

. . . for corrosive service and stainless and cast steel for unlined services; *Centrifugal Pump* bulletin gives specifications and performance curves for the various models. Industrial Filter and Pump Manufacturing Co., 5900 Ogden Ave., Chicago 50, Ill.

Circle No. **58** *on Reply Card*

Welding Stainless Tubing

. . . by fusion, metallic-arc, oxy-acetylene, atomic-hydrogen, inert gas arc and flash-butt; *Technical Data Card 162* covers austenitic and ferritic stainless grades, discusses proper joint design, and lists recommended welding procedures, electrode selection, preheating and post welding heat treatment. The Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Pa.

Circle No. **59** *on Reply Card*

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Lightweight, simple, adaptable with complete freedom of layout, GLITSCH "Truss-Type" mechanical design is not restricted to standardized patterns. You specify your process requirements.
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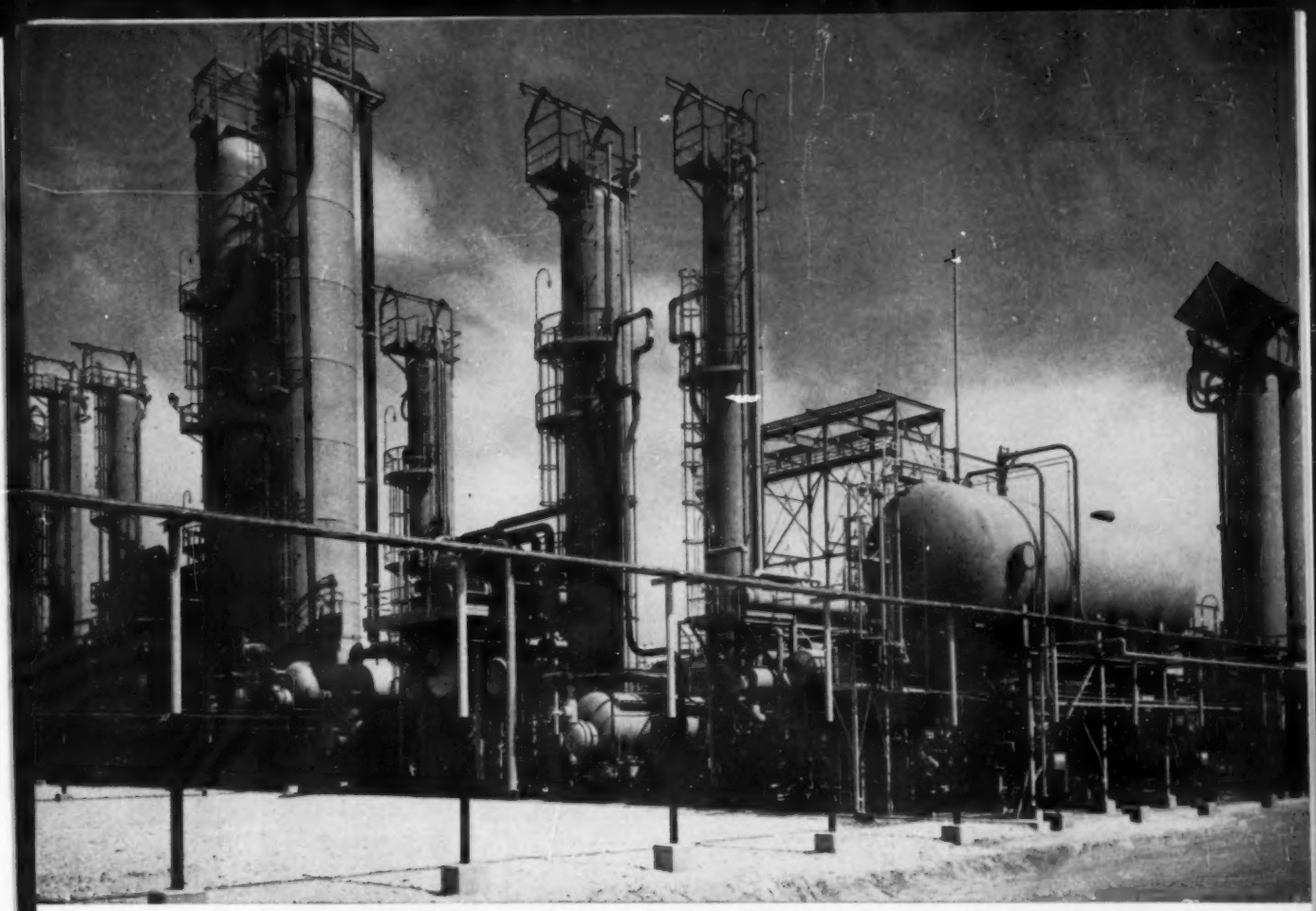

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THE owners bought this plant before the plans were on paper. You'll be doing that, too, when you sign a contract for your new plant—and you'll have to be ***sure*** of the qualifications of the firm you hire.

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To aid in this program, Cooper-Bessemer has strategically located service warehouses which offer prompt delivery of any needed replacement part. You don't have to stock an expensive or extensive parts inventory, as Cooper-Bessemer factory parts will always be available ... even if the engine is no longer in production.

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If your power problems fall within the 200 to 5000 hp range, reliable Cooper-Bessemer Diesels, gas engines and heavy-duty compressors offer the economical and long-lived answer . . . and with the best of service always at your command.

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DIESELS • GAS-DIESELS • GAS ENGINES • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS

Exchanger Tube Expanders

. . . for heat exchangers and condensers; *Bulletin Y-38* describes expander, its use in rolling jobs, size selection and prices. Elliott Co., Lagonda Div., Springfield, Ohio.

Circle No. **60** *on Reply Card*

Did You Miss These?

The following items, reviewed originally in September, have aroused considerable interest among the readers. They are repeated briefly as a service to those who might have missed them the first time they appeared. For details or literature, please use the regular Reply Card in this issue.

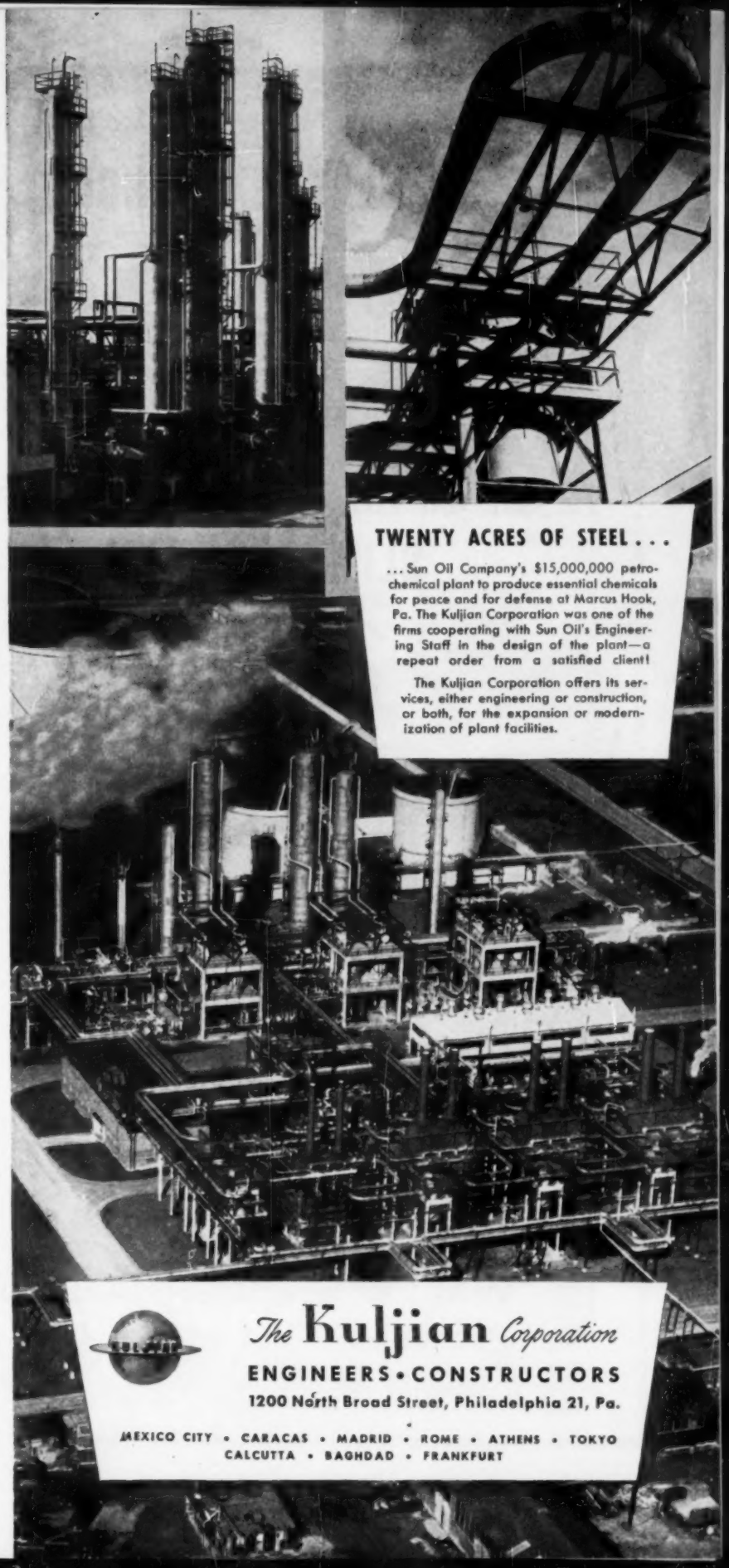
Kit Permits Rapid Inspections Of Pump Parts, Valve Bodies

. . . and welded surfaces for cracks indicative of wear and fatigue. Light in weight and portable, the "Magnaflux Y-5 Yoke Kit" is designed for preventive maintenance, weld inspection, and limited volume inspection of magnetic parts. It is said to be very useful in salvage work. It comes in a metal carrying case, about the size of a fishing box, and weighs less than 30 lbs. complete. Magnaflux powder, powder bulbs, and instructions are included. The testing yoke is equipped with 100 ft. of cord, and draws only 6 amps. from any 110 volt a.c. line. One man performs the inspection. He handles the yoke in one hand, and with the other hand he dusts on the powder. Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.

Circle No. **61** *on Reply Card*

Packless Proportioning Pump Provides Pulse-Free Flow

. . . and accurate control. The new "Hills-McCanna-Meter" is said to measure precisely quantities from 5 cc. to 6 gal./hr., depending upon the material being handled. Unit has handled quantities as low as 3 cc./hr. under actual operation, with good consistency and ability to reproduce. Standard speeds range from 27 to 900 strokes/minute for this positive displacement pump. Gases and vapors are vented automatically. Standard units will develop pressures up to 2500 psig. There are no packing glands or stuffing boxes. Unit is sealed and leakproof. Automatic control can be used if desired, utilizing direct instrument air signal. The alloy in contact with the fluid being pumped is relatively small. A complete changeover to a different alloy can be accomplished at


TWENTY ACRES OF STEEL . . .
. . . Sun Oil Company's $15,000,000 petrochemical plant to produce essential chemicals for peace and for defense at Marcus Hook, Pa. The Kuljian Corporation was one of the firms cooperating with Sun Oil's Engineering Staff in the design of the plant—a repeat order from a satisfied client!
The Kuljian Corporation offers its services, either engineering or construction, or both, for the expansion or modernization of plant facilities.
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Where you need

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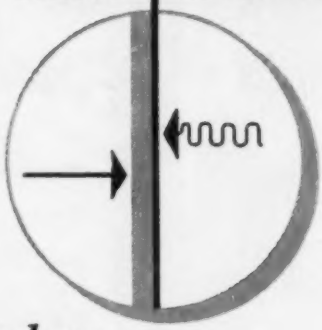
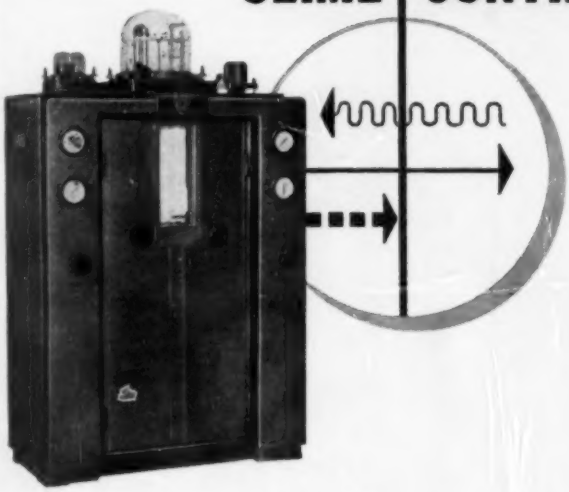


Be sure you have

SLIME | CONTROL



Whether you heat or cool water for make-up, process or any other use, you will need Wallace & Tiernan Chlorination to help combat slime problems introduced by water-borne bacteria or air-borne bacteria.

With slime control equipment designed for any need, built for lasting and dependable service, highly accurate and backed by over 40 years of successful application experience, Wallace & Tiernan Chlorination can help you increase the efficiency of your plant and cut operating costs. For further information write our Industrial Division.

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CD-39

low cost. The pump is also adaptable to ganging in an arrangement wherein additional units are simply connected to the basic unit. Additional motors and speed reducers are not required. Hills-McCanna Co., 3025 North Western Ave., Chicago 18, Ill.

Circle No. **62** *on Reply Card*

Cast Alloy Data Sheets

. . . collected in a booklet form: chemical composition, mechanical and physical properties, resistance to major corrosives, machinability, heat treatment and weldability are given for each alloy: also, equivalent designations of ACI, AISI, SAE, and ASTM are included. Cooper Alloy Foundry Co., Hillside, N. J.

Circle No. **63** *on Reply Card*

Flange Surface Finishes

. . . and their effect on gasket sealing and joint performance; *The Gasket, Vol. 1, No. 7,* outlines experimental work done with different machined flange surface finishes and the results; gives a list of recommendations for different gaskets. Johns-Manville, 22 East 40th St., New York 16, N. Y.

Circle No. **64** *on Reply Card*

Water Treatment

. . . processes, their chemistry and industrial applications; booklet *If You Use Water* discusses the fundamentals of three main kinds of water treatment based on ion exchange: softening, dealkylization, and deionization; advantages of the more than 12 different processes for specific applications; flow diagrams. Rohm & Haas Co., Washington Square, Philadelphia 5, Penna.

Circle No. **65** *on Reply Card*

For Your Convenience

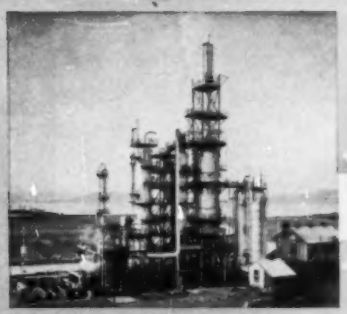
Business reply cards are included in each issue of Petroleum Processing to assist you in obtaining more information on any items received in "What's New!" You'll find them facing the first page of this section. Just circle the numbers corresponding to the numbers at the end of each item. Then fill in the rest of the card and drop it in the mail. No postage is required.

another complete refinery . . .

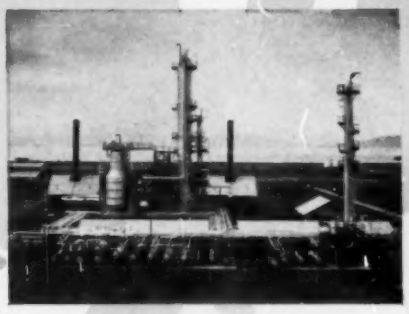
BATANGAS BAY, PHILIPPINE ISLANDS

This new Caltex refinery comprising Crude Distillation, Model IV Fluid Catalytic Cracking, Liquid-Phase Catalytic Polymerization and Propane Decarbonization is now "on stream". It is the

"first in the Philippines"



The Model IV Fluid Catalytic Cracking unit

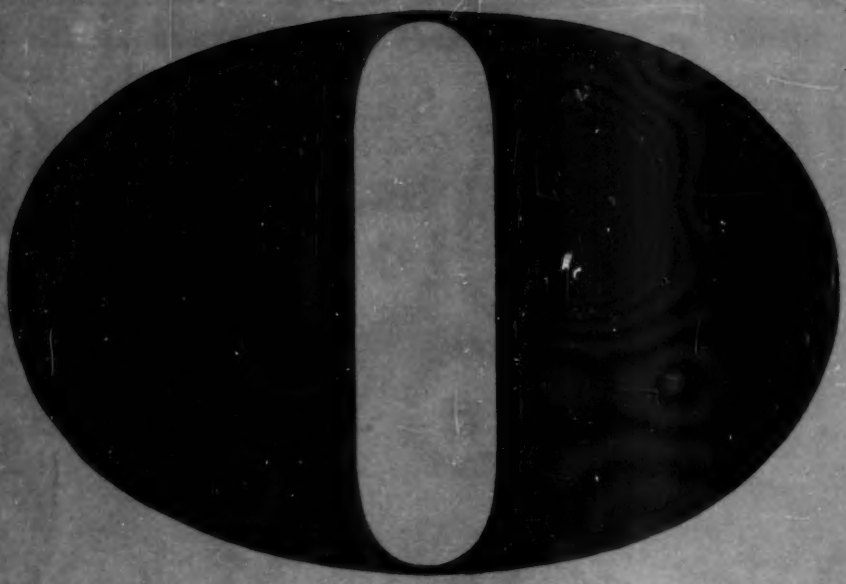


The two-stage Crude Distillation unit

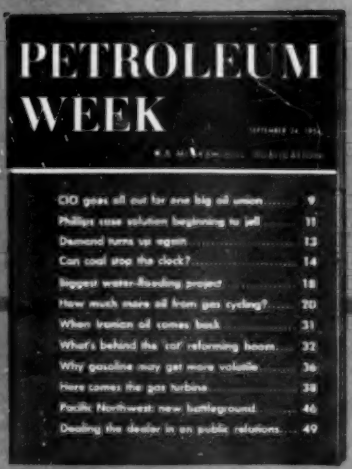
FOSTER WHEELER

165 BROADWAY, NEW YORK 6, NEW YORK

the world of



gets its own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EVERYTHING IMPORTANT IN OIL will be the unique province of Petroleum Week. This new communication service will keep men who matter posted on every phase of the oil industry—by giving the big picture fast, by filling in important details too . . . *through an important new technique of writing for variable-speed reading.*

oil business weekly

Oil is a fabulous business—colossal, and still growing. Its gain in volume of output in the next two decades will outstrip even the amazing growth of the last quarter century. Its technology progresses so fast that galloping obsolescence is a state of normalcy. Oil has molded the American way of life, created empires, determined the course of at least one World War.

Oil men learn fast, think fast, act fast. Theirs is a world whose tempo quickens daily. Within their own realm, these men—the men who really matter throughout the oil business—*need* a communications service totally different from that now provided either by petroleum publications or by the general business press.

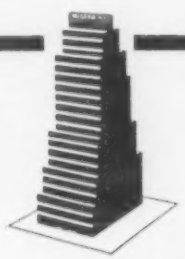
They need a cross-communication service that briefs the reader on everything important that happens to or in the oil industry—every segment of the industry, not just his specialty alone. This need goes far beyond spot news reporting, beyond analysis of trends, beyond coverage of technology, yet it includes all of these.

This information must be presented so a reader can hit all the high spots in a matter of minutes—then focus his attention and find all significant details too.

Impossible? We don't think so. The story on the next two pages tells why.

PETROLEUM WEEK

330 West 42nd Street, New York 36, N. Y.



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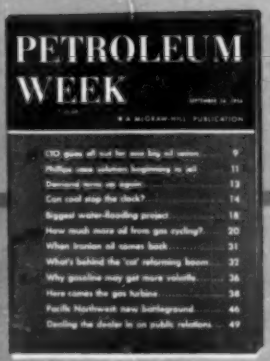
because oil men tell us they need this new information service



. . . a totally new publication, a totally new concept of writing for busy readers, enters the business press.

Petroleum Week's assignment is to meet two big needs shown in our research . . .

. . . 1—*For a truly industry-wide and industry-deep publication* covering significant developments in all segments of the oil industry—with the facts technically correct but interpreted into plain English for broad usage throughout the industry.

. . . 2—*For a publication that can be read efficiently,* at high speed, by busy men in an industry deluged by a mass of communications.

YOUR 1955 BUDGET WILL MAKE YOUR ADVERTISING DOLLAR WORK HARDER IF IT INCLUDES AN APPROPRIATION FOR PETROLEUM WEEK. Pilot issues are being printed now . . . regular publication will start in July. Be sure to capitalize on the intense interest this new magazine will arouse throughout the oil industry!

How we plan to serve Need No. 1—for a truly all-industry publication:

There are many oil publications serving specialized branches. We publish some of them ourselves. They have important roles to play. But the industry tells us that no one is providing vital information about *all* branches—production, refining, transportation, marketing—that is written in terms that are clear to oil men who are not specialists in the branches the information comes from.

Oil is an industry of intense specialties. It is segmented and technical. But it is an interdependent, integrated industry—even outside the "integrated companies." Basic developments in one segment are of great importance in other segments.

Because of its specialization, the oil industry presents great difficulties in cross-communication among the specialists—and between the specialists and the general management. Yet in this fast-moving industry such cross-communication is vital.

This is a challenge that we will meet as we work with the oil industry to design Petroleum Week. *We will report and interpret important information from any specialized branch—no matter how technical—so it can be read with understanding by (1) specialists in all branches, (2) general management men, and (3) men who are moving ahead, wherever they may now be in their companies.*

How we meet Need No. 2—for an efficient-to-read publication:

A revolution is going on in communications. It has been provoked by the growing complexity of our life—by the need for more and speedier information—and by the vast growth of communication facilities.

An important phase of this revolution is in reading. Our children are being taught to read differently—to read silently for comprehension with speed, not just orally with good enunciation and expression as we were. Thousands of businessmen are taking courses inside and outside their companies—and reading some of the many new books on the market—to learn how to keep up with the printed and typewritten material that they should read.

One of the keys to more efficient reading is a technique that might be called variable-speed reading. You do not pore over every word and every line at the same rate. You find ways to recognize the "high spots"—and you discover that they stick in your mind much better than if you had not sought them out as "high spots," but had merely read them along with the surrounding mass of details or supporting facts.

To put it another way, you scan your reading material rapidly to discover the main points, the big ideas. You "shift gears" to read the details closely only when they are particularly important to you as an enlargement on the main point. Tests show that those who develop the ability to read this way gain more than speed; they also improve their skill in catching and remembering the main points of what they read, and the useful details as well.

Now, we are learning that as publishers we can help our readers acquire and apply this skill. *Petroleum Week is the first publication we know of that is being designed from the start around the requirements of the new art of variable-speed, more efficient reading.* By the use of bold-face and other "display" type for all the high spots or main ideas—and *only* for them—we are building "signals" into our articles to call attention to the key facts. The reader then can quickly find the high spots. It may be that he is looking for nothing else; if so, he can find them with no waste time—and he can be sure he has seen them all. In many cases he'll want details; in such cases he is guided to the detail by the main-point "signals."

In effect, we are developing a way to write and print Petroleum Week for variable-speed readership—so that you can read it with maximum efficiency without waste time. We invite you to ask our representative to show you examples of this type of writing. We think you'll see quickly what we mean.

FAST YET EFFICIENT COMMUNICATIONS THROUGH VARIABLE-SPEED READING

"Cut the copy!" What advertising man hasn't been badgered by this command? "Keep it short and punchy—yet pack in all the facts!" The Petroleum Week technique provides an answer to this vital communication problem.

Variable-speed reading makes it possible to get a broad picture fast . . . then come back, so to speak, and fill in the details.

Writing for variable-speed reading is a technique all its own. (Try it some time.) You have to do more than just be clear, complete, concise. You flag *all the high spots*—and *only the high spots*—and present them in the sequence easiest to follow, which means knowing your subject and your reader pretty thoroughly.

An example of what we're talking about is this very spread. We'd like to know what you think of it. Even better, see how variable-speed reading works page after page in Petroleum Week. You can get a pilot issue from the McGraw-Hill office nearest you.

PETROLEUM WEEK

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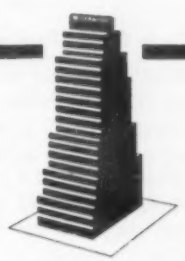

A McGRAW-HILL PUBLICATION

EDITORIALS . . .

Wanta Play Some Football?

THE request by California's Governor Knight that all refineries in the Los Angeles basin be closed down during the recent severe smog spell out there shows again how that problem is always good for a rousing game of political football.

To review the situation briefly, Los Angeles was beset in October with a prolonged siege of smog. After about three weeks of it, during which public protests grew progressively louder, Governor Knight on Oct. 22 sent telegrams to all refiners in the area, asking them to close down shop immediately to prove "conclusively once and for all whether or not they are the prime contributors." Oct. 22, by the way, was just 11 days before the gubernatorial election.

The refiners politely and firmly said "No, thank you!"—although they weren't as quick about doing so as we think they should have been.

The governor overlooked one basic fact. Smog is an accumulation of contaminants, an accumulation which gets trapped under a blanket of warm air (an inversion layer) which settles over Los Angeles and refuses to budge. As long as that layer of air stays put, the contaminants build up and become progressively more obnoxious. Given a good accumulation and a stubborn inversion layer, you could cut off all sources of contamination and still have the same smog—as long as the inversion layer stayed put.

Let's assume the refiners had said "Yes" and had shut down their plants. Here's what might have happened.

If the inversion layer had stayed put for a week, the smog would have continued to be just as bad—and the refiners, pointing to their idle plants, could say "Look, we aren't doing it."

Or, if the layer had suddenly moved out to sea and taken the smog away with it, the populace could have pointed to the refineries and said "See, you shut down and the smog goes away; you're guilty."

Maybe what the refiners should do is hire a good long-range weather prognosticator. Then, the next time the smog gets bad and the prediction is for a prolonged continuation of the inversion layer, they should all shut down until just before it lifts. In that way they could "prove" they were blameless.

You've Got It—Live With It

IT WAS heartening during the recent API meeting to hear someone come out and tell the industry that its refining capacity is not overbuilt as much as some sources would have us believe. M. J. Rathbone, president of Standard Oil Co. (N. J.), told one session that the estimated 15% of spare capacity is not excessive, and that they'd better learn to deal with it. We like his words:

"It seems obvious to me that our industry is going to have substantial spare capacity for some time to come.

"Is that frightening? It shouldn't be. Any industry as vital as ours to the country's security and welfare has to have reasonable spare capacity. We must be prepared for unexpected demands and possible interruptions to normal supply, let alone the needed strategic reserve for possible military requirements.

"Opinion will vary widely as to what is 'reasonable spare capacity.' Considering that the planning, design and construction of today's complex refineries take at least two to three years, today's refining spare capacity of around 15% does not seem unreasonable to me."

Spare capacity costs money and creates problems. But, as Mr. Rathbone points out, the industry's inability to provide adequate service and supplies, or a failure to meet a national emergency could be much more costly and create even greater problems.

"We may as well face it," he admonishes. "We are going to have to live with substantial spare capacity. To me it is unthinkable that we would not carry the reserve needed for national security, or would fail to maintain the flexibility required to meet unexpected developments in supply or demand."

Let's stop moaning about too much capacity and put our minds to work on how to deal with it wisely.

Add a Bit of Showmanship

A UNIQUE feature of the Group Session on Fundamental Research at the recent API meeting in Chicago was that not a single one of the seven technical papers on the program was read at the meeting, even in abridged form. Instead, the authors undertook to present the story of this group of API projects in a manner which was of interest to even the non-technical listener. They told of the significance of the projects in terms of practical usefulness to the oil companies, how the studies are carried on, and where the work is done.

Various "props," some homemade, helped in the presentation. One author used a model of the stage and slides to demonstrate the principle of selective adsorption of one of two liquids by a solid. An eminent western university professor used colored balls and toy balloons from a dime store to illustrate how atoms live together in a molecule. One group played back a recording of a TV scientific program to make their point. Another report was given in the form of a panel with the heads of the project on the platform to answer questions.

Obviously, the form of presentation was not prepared for an audience of technologists. It was arranged to interest oil company management and others outside the research laboratories in the importance of the API research projects. The size and attention of the audience in Chicago indicated the interest in this venture in popularizing a technical proceeding.

This move is in the right direction. It should be used more in the presentation of technical programs where the work to be reported has significance outside the laboratory, as indeed practically all research does. Various mediums today compete so clamorously for everyone's eyes and ears that the scientists who want outside attention for their work will have to resort to showmanship in one form or another.

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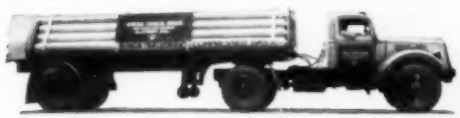
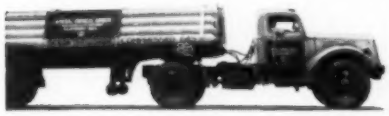


For Petroleum



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And Gain These Important Advantages:

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- Improved properties of end products
- More reactions carried to completion
- Fewer undesirable waste materials
- Greater catalytic activity from smaller quantities
- More easily controlled reactions

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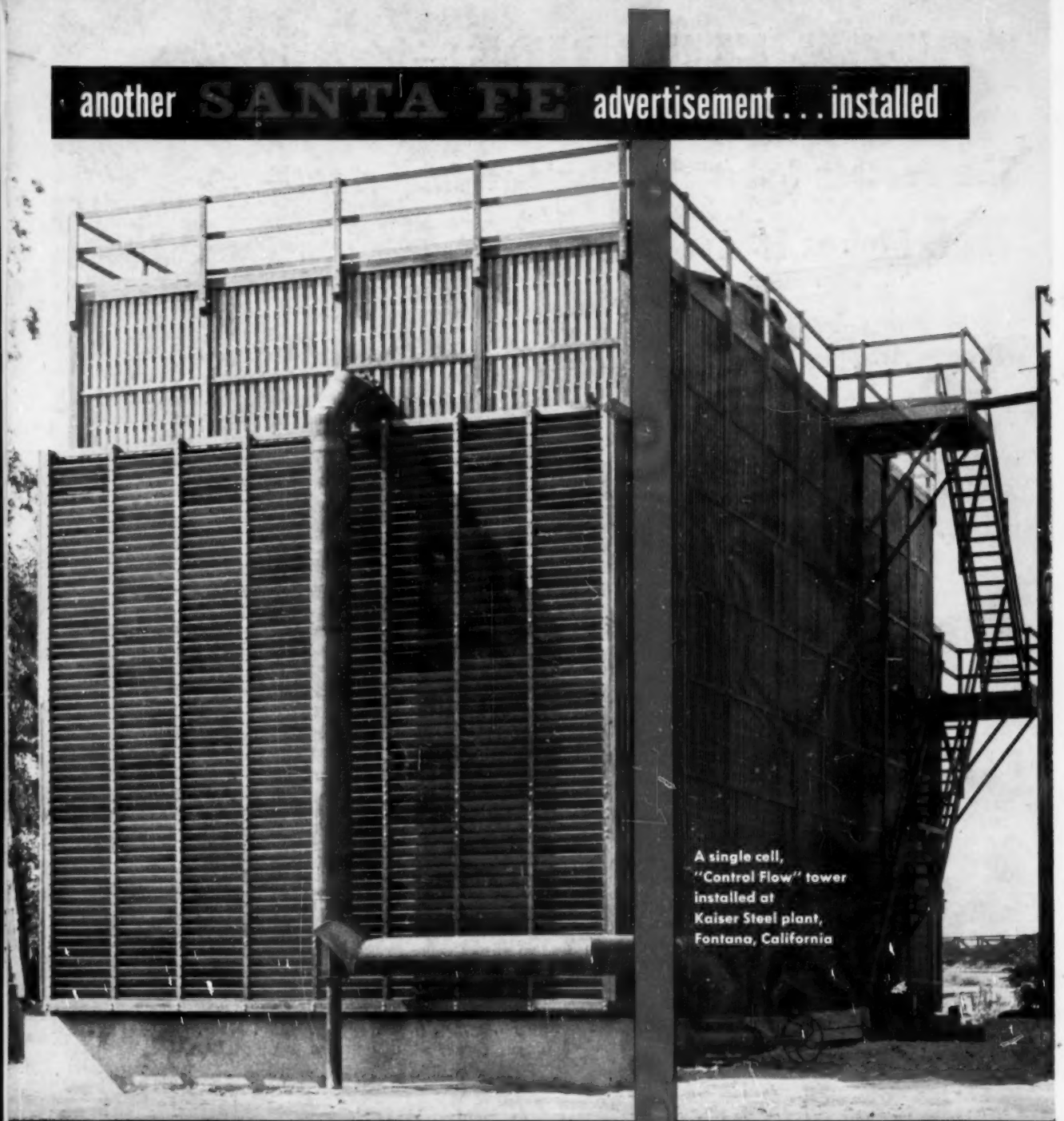

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